



Two Decades of Studying the Future

Collection of Reports and Papers Documenting
The ASQ Future Studies Program (1993-2015)

GREGORY H. WATSON, editor
2019





Editorial Comment

This collection of papers and reports documents the two-decade-long investigation by the American Society for Quality (ASQ) into the way that global trends can influence the future of humanity and how the quality profession needs to adopt in order to remain relevant in the face of these changes.

These studies were initiated by ASQ President David B. Luther during his presidency. Prior to these studies ASQ had conducted a so-called Constitutional Convention to review and revise its governing bylaws and constitution so they would be current with its evolving mission and vision. One outcome of this activity was the crystallization of the need to become clearer about the challenges and opportunities that ASQ and the quality profession would face in the future.

The documents contained in this collection represent work product of the triannual Future Studies that were conducted over a period of two decades (1995-2015) which also contains by-product articles that were outcomes of these studies. The purpose for presenting these papers in a single collection is to document this work so that future generations of quality professionals may develop continuing insight into the forces that will shape the future of this profession.

These papers are published solely for the purpose of research to set a baseline for future inquiries regarding the direction that the quality community should seek to pursue to maintain its relevance and to contribute to the well-being of humanity for future generations.

Gregory H. Watson
Espoo, Finland
17 June 2019



Table of Contents

1. David B. Luther, ed. (1996), "Quality, The Future, and You: ASQ Future Study."
2. Gregory H. Watson (1998), "Bringing Quality to the Masses," *Quality Progress*.
3. Gregory H. Watson (1998), "Digital Hammers and Electronic Nails," *Quality Progress*.
4. Gregory H. Watson (1998), "The Emancipation of Quality," *Quality Progress*.
5. Gregory H. Watson (1999), "Back to the Future," *Quality Progress*.
6. Gregory H. Watson, ed. (1999), "Foresight 2020 – ASQ Considers the Future."
7. Gregory H. Watson (2000), "Foresight 2020: The Future of Quality in the Age of Technology," *Journal of Innovation Management*, 6:1, pp. 31-42.
8. Kenneth E. Case, ed. (2002), "Living in the Future – 2002 ASQ Futures Study."
9. Paul E. Borawski, ed. (2005), "In the Chase – 2005 ASQ Futures Study."
10. Soren Bisgaard (2005), "The Future of Quality Technology," *Quality Engineering*.
11. Paul E. Borawski, ed. (2008), "No Boundaries – 2008 ASQ Futures Study."
12. Toddi Gutner and Mike Adams, eds. (2009), "A Leadership Prescription for the Future of Quality," The Conference Board Quality Council.
13. Gregory H. Watson (2011), "Prognostications: Scenarios of the Future as Viewed in 2011," International Academy for Quality.
14. Paul E. Borawski, ed. (2011), "Emergence – 2011 ASQ Futures Study."
15. Deborah L. Hopen (2011). "Changing the Role of Quality," *Journal of Quality and Participation*.
16. Deborah L. Hopen (2011), "Preparing for the Future," *Journal of Quality and Participation*.
17. Rick Maurer (2011), "The Writing was on the Wall, but We Thought it Was a Forgery," *Journal of Quality and Participation*.
18. William Troy, ed. (2015), "Quality Throughout – 2015 ASQ Futures Study."
19. Tyler Gaskill (2015), "Experts Offer Predictions on the Future of Quality," *Quality Progress*.

QUALITY, THE FUTURE, AND YOU

An ASQC Consideration of the Year 2010



A MESSAGE FROM THE CHAIRMAN

by David B. Luther

ASQC is an organization in transition. We have grown from our founding in 1946 to an organization today of over 130,000 members. In those same 50 years, we have seen Quality move from a discipline used mainly in the manufacturing environment to a sophisticated body of knowledge applied to a wide variety of organizations. It's reasonable to anticipate that the future will hold continuing change for both ASQC and the Quality sciences.

Such change implies new challenges, opportunities, and threats to the continued growth and prosperity of the Society, its members, and its stakeholders. Thus we decided to use the milestone of our 50th anniversary to undertake a "Futures Project." We invited a diverse team of people to participate in a group effort to look ahead to the year 2010. These individuals brought experience and insight from their respective areas, and collectively represented both what is very new and what has a long history in ASQC. We also invited other leaders from a number of areas to contribute their own thoughts on the future, independent of our collective process. The results of these parallel efforts follow.

Of the forecasts we made, none seems more certain than this: that any organization that is to survive to the year 2010 must have two processes in place today. First, it must be able to learn from its environment. Second, it must be able to convert the lessons it learns into effective action for meeting its chosen goals.

On behalf of ASQC, I thank the individuals who contributed their time and thought to this project. In particular, I want to add my personal thanks to the members of the team for their significant investment of time as well as talent. It was an honor and a privilege to work with each of them, and I grew personally from our shared exploration.

I hope you find that the thoughts put forward stimulate your own thinking and prove valuable as you plan your own future. And I hope that a future chairperson of ASQC will look back and say, "They may not have gotten all the pieces right, but they did get us moving in the right direction."



D Luther

THE ASQC FUTURES TEAM

Maureen A. Bisognano
Chief Operating Officer
Institute for Healthcare Improvement
Boston, MA

Paul Borawski
Executive Director
ASQC
Milwaukee, WI

Edward Fuchs, Ph.D.
AT&T Bell Labs (retired)
Ocean, NJ

Aleta Holub
Vice President-Manager, Quality
Assurance
First National Bank of Chicago
Chicago, IL

Vince Hope
Manager, Market Research
ASQC
Milwaukee, WI

Spencer Hutchens Jr.
Senior Vice President
Inchcape Testing Services
Rolling Hills, CA

Michael D. Jones
Director AR Quality Center
Westark Community College
Fort Smith, AR

David B. Luther
Chairman of the Board
ASQC
Corning, NY

Dale J. Mischynski
Corporate Vice President
Director of Quality and Standards
Motorola, Inc.
Shaumburg, IL

Debra A. Owens
Debra A. Owens Associates
Antioch, IL

Lawrence Schein
Program Director, Quality &
Productivity
The Conference Board, Inc.
New York, NY

Paula Sommer
President
Institute for Standards in Quality
Education
Arlington, TX

Brad Stratton
Editor, *Quality Progress*
ASQC
Milwaukee, WI

Raymond Wachniak
Editor, *CONTACT*
International Academy of Quality
Brookfield, WI

Gregory H. Watson
Managing Partner
Business Systems Solutions, Inc.
Victor, NY

Jack West, Ph.D.
Northrop Grummon
Glen Burnie, MD

Sheila Zelenski
Director, Membership Services
ASQC
Milwaukee, WI

**ALTERNATIVE FUTURES
ASSOCIATES**
Alexandria, VA

Clement Bezold, Ph.D.

Atul Dighe

Suzanne Masica
Masica and Associates
Santa Fe, NM

ASQC INTERNAL TEAM
Milwaukee, WI

Brenda Mooney
Linda Nordstrom
John Ryan

Executive Summary



During its 50th anniversary year, ASQC undertook a structured look at the year 2010. The key questions in the endeavor were: where is Quality heading and how will the future impact ASQC, its members, and other users of Quality, both now and in the future.

A diverse team of 18, representing a broad mix of professional areas, backgrounds, and skills, met over a period of six months. Through the approach, they identified key forces, which they then used to develop four varied scenarios of the year 2010.

Following this, they examined the vision, mission, objectives, and strategies of the Society to determine their adequacy for dealing with each of the future scenarios. Equally important, they also used the scenarios to project changes in the roles of the Quality professional and the user of Quality tools and techniques who is outside the Quality function.

Each of the nine key forces identified is a powerful driver of change. When considered together, these forces appear to be propelling

the rate of change still faster than that of the last 15 years. Changing values, the first force, will impact both personal lifestyles and national priorities. Environmentalism, drug use, wealth distribution, ethnic nationalism, and employer/employee loyalty were among the values perceived to be reshaping our lives. The force of globalization includes the increasing role of world-spanning organizations, the enormous potential influence of China and India, and the expansion of liberal democracy as a platform for change. The changing makeup of the work force reflected increased immigration, an age shift in the working population, and a restructuring of the workplace resulting in more individual agents and fewer lifetime employees. The information revolution, of all the forces, is having the greatest impact already, and that impact is predicted to increase in the future. It will affect significantly production, marketing, education, government, and other major systems. The velocity of change itself is seen as a force, and increased customer focus, with a lot size of one and individually tailored marketing, will be a major determinant of commercial survival. Leadership will remain a key force; speculation emerged that one of its major thrusts would be promulgating values, and that it would likely influence people who are never seen in person. Quality in new areas is the expansion of Quality into new sectors, and from that, important feedback and learning for traditional users of Quality. Change in Quality practice will be reflected in the complete integration of Quality practice into daily work.

Four scenarios described possible outcomes for the year 2010.

Global Reality, the most probable scenario, extends the current issues and is characterized by rapid economic growth, continuing problems with technical and economic underclasses, and widespread use of Quality tools. Hard Times projects sluggish growth, serious depletion of natural resources, ineffective governments, and severe personal security issues. Mixed Bag combines commercial and technical innovation moving at a rapid pace, offset by a declining standard of living in the United States, as low-cost (and consequently low-priced) offshore competition becomes a force. Designer Nation, the fourth scenario, is the most positive. Real income grows; there is more personal time; health care and education become both effective and efficient, and Quality is pervasive.

The team drew some observations from these scenarios. In considering society at large, they projected for the immediate future an increased rate of change, the pervasiveness of the information revolution, greater problems with ethnic nationalism, widening gaps in wealth distribution, and continuance of today's problems with health care and education in the United States. Further out, they predicted widespread use of Quality, the formation of short-lived, specifically focused virtual organizations, increased influence from multinational organizations, and nationwide consensus-building.

Conclusions about the Quality professional were much more specific. They will be fewer in number, in most areas, and will be

more involved in strategy development. Communication, strategic thinking, information retrieval, and interpersonal skills will be essential to their work. Their contribution to the improvement of society will be needed and important.

For other professional managers and individual contributors, the knowledge and application of Quality tools and techniques will be mandatory. Quality management will be pervasive and integrated into the way things get done every day. Managers will need to undertake organizational self-assessment based on Quality principles and be attuned to where both their own organizations and others are headed.

The major conclusion about ASQC is that the present vision and plan are insufficient for meeting the challenges of the future, as described by each of the four scenarios.

Many recommendations emerged for ASQC that would improve the organization's capability. Making information technology really work for the Society, becoming more customer-focused, broadening membership, and improving governance headed the list.

The final recommendation seems to apply to all organizations, and probably to most individual and personal situations as well.

Begin now. Understand the environment, and observe where change is going. Tailor action to the new direction. Move quickly. Be adaptive. Learn from mistakes. Do it again.

QUALITY, THE FUTURE, AND YOU

“Hats off to the past; coats off to the future.”

—*American Proverb*

Fifty years after its founding, ASQC chose not only to honor the past but also to roll up its sleeves to prepare for the future. The challenge was to understand some fundamental questions. Where is Quality heading? How will the future impact ASQC as an organization? How will it affect the Quality professionals who now comprise its membership? Who, in fact, will future members be? How will the future influence the many who are not Quality professionals, but who utilize Quality tools and techniques?

The answers to these questions should provide valuable information, not only to those involved in planning for the organization, but also to its members and an ever-larger number of people who practice Quality.

ASQC'S FUTURES PROCESS

The exercise began with the formation of a broadly based team of 18 people whose mission would be to focus on the year 2010. Representing health care, education, the public sector, banking, manufacturing, and service, team members came from the membership of ASQC, the staff of the Society, and areas outside of ASQC.

A discussion of the world of 2010 will be enriched by including individuals of varying viewpoints. Several such people were asked to join the 2010 discussion by providing their thoughts about the future. The specific invitation was as follows:

I invite you to join us in our efforts by giving us two, three, or more statements about the year 2010 from your standpoint. Based on your unique position, and your view of the trends we see about us today, what can you say about an era that is 14 years away? The statements can apply to business, to society, to technology, or to any facet of modern life that could impact the future.

RESPONDING TO THE INVITATION WERE:

Paul A. Allaire, Chairman and CEO, Xerox Corporation
Asbjorn Aune, The Norwegian University of Science and Technology
Marietta L. Baba, Cultural Anthropologist, Wayne State University
Paul Batalden, M.D., Director of Health Care Improvement, Dartmouth Medical School
Marcos E.J. Bertin, Firmenich, S.A., Buenos Aires, Argentina
James L. Cash Jr., James E. Robison Professor of Business Administration, Harvard University, Graduate School of Business Administration

Armand V. Feigenbaum, Ph.D., President, General Systems Company, Inc.
Jennifer James, Ph.D., Cultural Anthropologist, Jennifer James, Ph.D., Incorporated
Brian L. Joiner, CEO, Joiner Associates Incorporated
Stuart R. Levine, CEO, Dale Carnegie & Associates, Inc.
Stan Lundine, Attorney, Former Lieutenant Governor, New York State

Over a six-month period, this group spent approximately 60 hours together and at least an equal amount of time individually and in small units. The process was facilitated by Alternative Futures Associates. Appropriately, much of what is described below was developed on the Internet, one of the key forces the group identified.

Participants were charged with identifying, describing, and debating the key forces that could impact society, and then, using this key forces list, with developing several scenarios of the future. Current plans and assumptions about the future were to be tested against each scenario and adjusted if found insufficient. Specifically, participants were also asked to consider how each of the scenarios would impact the current strategic plan of the Society, the current role of the Quality professional and the use of Quality by others.

Paul A. Allaire, Chairman & CEO, Xerox Corporation:

Any time we talk about preparing for the future, we need to talk about learning and training. Xerox has dedicated itself to being a learning organization, and I don't think that will change by 2010.

Still, the way we work is changing and we have to look at ways to help shape the workplace of the future through new technology. Because work has become much more cooperative in nature, technology must support this distributed sharing of knowledge. As we make advances in technology, we must always be thinking about process innovation: how workers think, how they work, and what makes them more productive. Learning and work go hand-in-hand, because much of what we learn, we learn from each other. This will be as true 14 years from now as it is today.

Just as our commitment to learning won't change, neither will our commitment to quality tools. Quality is how we run our business.

We learned the quality lesson the hard way in the 1980s and the lessons learned will be still embedded in the way we do business in the next century, no matter what the economy is doing or what political course the world is pursuing.

Underlying this exercise is the notion that while we cannot predict the future, we can prepare for it. The scenarios provide a foundation for that preparation. While none is likely to provide a full view of the future, a portion of some or all is likely to occur. Thus, if plans take each scenario into account, they should provide adequate preparation.

KEY FORCES

The team defined a "key force" as a powerful change or trend in a social, political, technical, or behavioral area that currently has, or soon will have, a substantive impact on people's lives. Nine were identified; from these, the team created four scenarios of the future.

Changing values of both individuals and the whole of North American society was the first powerful force on the list.

At the macro level, several manifestations of these shifting values emerged. One group of these centers on the environment: preserving natural resources and reducing consumption and waste in virtually all public and private organizational processes. The team identified a trend toward solving such problems within the community rather than at federal or state levels.

Ethical issues were also perceived to be an important part of the changing values of society. Defining life and limits in genetic engineering, and safeguarding privacy and security in new forms of electronic communication were among the critical ethical issues that will impact the future.

The disparity between the "haves" and the "have nots" was perceived to be at the root of multiple social problems. Crime is an outcome of such disparity, not only in the United States, but elsewhere. Thus far, society has failed to curb the problems of inner cities, the use of drugs, and the illegal immigration of aliens. In addition to these social issues, ethnic nationalism may well continue to be a major force in the disruption of nations, economies, and personal lives.

At the individual level, one area of changing values relates to the nature of work. As the nature of employment shifts from employer/employee to buyer/seller, one result is the disappearance of loyalty on both sides—to employers and to employees.

Within commercial enterprises, organizational values are emerging as an important factor. In the future, the most important challenge for senior management may be to define, communicate, demonstrate, and use these as the appropriate guidance for rapidly moving, remote, or complex activities.

Professor Asbjorn Aune, The Norwegian University of Science and Technology:

- *The daily work for most people in business and industry will be more like today's situation than the scenario described by the IT industry. The same goes for the daily life in an average community in the industrialized part of the world.*
- *The winners in business and industry will be those taking best care of their employees, customers, and owners, in that order, given that the employees understand that their security and happiness depend on satisfied customers. In addition, the winners will demonstrate a process-oriented management style in organizations in which a very large part of the work will be carried out as projects, and where the wage/award system will be team-based and have a large element of profit and/or gain sharing. We will also see new performance measurements (because many of today's indicators are inconvenient and react too slowly, like driving your car sitting in the rear seat looking backward).*
- *Self-assessment based on criteria developed from quality awards and process assessment/certification will be much more important than third-party quality system certification based on the ISO 9000 series.*
- *We will see a new "definition" of Product Quality: A product is of good quality only when its use gives a high degree of satisfaction, safety, health, and happiness to all people involved in its production,*

distribution, use, maintenance, destruction, and reuse with a minimum use of energy and other resources, and without any negative influence on the society (indirect users) and environment.

Globalization was seen as a force, as borderless markets yielded to far-flung organizations marketing goods and services wherever buyers could be found. Job migration and information technology will change the way work gets done and paid for.

The emergence of China and India is an uncertainty, yet has the potential to be among the most powerful global forces. Both countries are economically important today, as both markets and sources of labor and expertise. In particular China, with its rate of growth from a modest base, promises to wield enormous economic clout. The Chinese military is another unclear but potentially powerful source of global impact.

Another major force in globalization is the spread of liberal democratic governance. This provides the platform for development of market-driven economies throughout the world.

The makeup of the **work force** was seen as an important area of change. Immigrants to North America will become an even larger source of new labor and energy, but attendant problems in language and basic skills will pose major challenges for business and education.

The role of older workers will increase, offset by voluntary reduction of workplace participation. In re-establishing basic values, individuals will elect to carve out more personal time. As there is more discretionary time in people's lives, volunteerism can be expected to increase.

Lifetime employment with a single employer appears to be decreasing. As employment shifts from employer/employee to buyer/seller, individual agents increasingly will sell well-developed skills to the organizations that once would have employed them. Concomitant with this shift, personal ties will be to a function, a particular technology, or a specific set of skills. Maintaining such skills requires life-long learning, which is seen to be another trend.

Marietta L. Baba, Cultural Anthropologist, Wayne State University:

The wave of economic, technological, and socio-organization change that is taking place in our environment challenges us to launch new research activities that will provide a fundamental understanding of the nature of the change and its implications for science and society. One of the most important challenges we face is the need to understand change at the interfaces between traditional disciplines (e.g., between engineering and management disciplines, computing and behavioral disciplines, biotechnology and ethics).

Research on organizational design also suggests that tall, mechanistic hierarchies are not capable of fast response, but that flat, dynamic networks have this capacity. A flat, dynamic network is one where people at the operation level are positioned and empowered to observe and act on changes in their environments. The dynamic network also is flexible, linkages between internal units are not hardwired, but can be re-programmed easily to respond to external change.

Finally, this organization of the future is a networked organization, meaning not only that its internal units share multiple connections with each other, but that it also is linked horizontally to external entities such as suppliers and customers (or stakeholders and constituents).

The **information revolution** is having, and will continue to have, a very significant impact on private and professional lives, on the way work gets done, on the way products and services are marketed and delivered, on the way education—at all levels—is delivered, and perhaps even on the way we govern ourselves.

Information processing, the speed of input and output, the amount of memory, and friendly, voice-activated desk-top power continue to increase as processing accelerates at rates predicted by Moore's law (doubling every 18 months). Universal access and huge, friendly data bases bring closer to reality the notion of the perfectly informed marketplace. Of all the forces, the impact of information technology seems to be having the most visible impact today.

The **velocity of change** itself made the list of key drivers. Looking back 15 years in a historical rear-view mirror, the team saw a world greatly concerned over the Soviet Union, unaffected by AIDS, managing without computers in the home or in many businesses, and responding to military power—rather than economic power—as the basis for competition.

Projecting those specific changes does not provide a view of the future; imagining that events of similar magnitude and surprise will occur does instruct us to expect great future turbulence. The speed at which organizations and individuals adapt to change, and the financial and social cost of that change, become key elements in determining success or failure. Learning to adapt to change becomes an important tactic. Again, technology is a driver of this key force. Major innovations—such as interactive communication of sound, image, and data to the home—accelerate the rate of change.

Greatly increased customer focus will be a major driver of the marketplace, and will be a key determinant of who survives commercially in the year 2010. Mass customization, lot size of one, and customers' intolerance for defects will be important factors. Individual buying habits will be electronically stored and used for highly tailored marketing efforts. Service will become the arena of competitive advantage for everything that is sold, as product and service defects drop dramatically and become nearly invisible. The role of the "middle man" will diminish as electronic links change buying habits.

In addition to its impact on commercial goods and services, increased customer focus will influence federal, state, and local governments. These entities will become Quality-driven, effective, and efficient service providers.

SCENARIOS

The ASQC Futures Team developed four scenarios, each driven by the key forces identified above and bounded by basic assumptions about outcomes. The process required participants to envision several distinctly different scenarios. In total, these were to project a broad range of likely outcomes, but not to accommodate all of the potentially devastating but low-probability phenomena such as worldwide plague or nuclear war.

Paul Batalden, M.D., Director of Health Care Improvement, Dartmouth Medical School:

1. *By 2010 there will be new infectious disease and disease-management challenges.*
2. *In the last half of the 20th century, we moved from a relatively well-developed industrial culture with good connections between daily activities and moral values to a relatively under-developed information and systems culture with limited connections. Between the activities of our daily lives and our moral values, in 2010 we will be living in a better-developed information culture...we will be better able to tie our use of information to our moral values.*
3. *The human genome will shortly be fully "mapped." This will increase the public sense that genetics is under our control. Increased pressures for abortion and pregnancy outcome management will occur. By 2010, genetic engineering mistakes will have become known—including the inadvertent development of a new pathogen (an infective organism).*
4. *In the last quarter of the 20th century, higher education costs have been rising steadily at a rate of increase that exceeds the perceived runaway increases in the costs of health care. By 2010 it will have become generally agreed that we cannot continue to front-load lifetime debt for our college population and widespread efforts to redesign our approaches to higher education for better value will be under way.*

Leadership will change. One prediction is that future leaders will exert influence on team members they may never see in person. Another change is in the content of leadership: in the complex, fast-paced society of the future, leadership of specific tasks will likely become secondary to establishing and promulgating values that will guide decisions made at the local level.

Quality in new areas is seen as a future force, and is already apparent. The application of Quality tools and techniques to education, health care, and the public sectors is a modest force today; it is expected to become a major force in the future. A migration of successful approaches from manufacturing to these areas seems to be assured. Less obvious is the probability that, as these sectors become proficient in Quality, their feedback may provide increased learning for the manufacturing and service sectors.

Finally, the change in Quality practice itself is a major force that will impact ASQC, its members, and, indeed, everyone engaged in adding value. The integration of Quality into daily work will eventually reduce the need for Quality professionals. Instruction in the use of Quality tools may be taught more effectively using information technology, thus reducing the need for "live" Quality instructors in the classroom. Likewise, technology likely will make the application of tools easier and more efficient, again reducing the need for experts.

Quality will become a major factor in sustaining competitive market positions. This will occur when Quality-driven strategies are determined by the needs of a specific product or service, its position in the life cycle, and its relative strength in the market, rather than by the needs of the whole organization.

Another factor that will change Quality practice is the increasing complexity of systems. Information technology and our own knowledge about systems behavior, especially large systems, may change dramatically the way value gets added and the way organizations are designed to create that value. Quality will need to address these issues.

5. *Information use will continue to change. By 2010 there will be a method for identifying and rapidly accessing each person anytime, anywhere—if that person is part of the “have” portion of the wealthy world. The gap between the “haves” and “have nots” may relatively increase by further limitations on information access for “have nots.”*

Global Reality is an extension of current issues and opportunities, and was thought to be the most likely prospect:

The years between 1996 and 2010 were prosperous, not only in North America but also around the world, especially among the developed countries. The most obvious changes were the new technologies, products, and services spawned by the information revolution. Understanding and influencing systems behavior in social, business, and process areas has become critical. Information technology continues to drive great change for all, and mass customization is the rule. Despite rapid growth, the gulf between the “haves” and “have nots” has widened, for both individuals and nations.

By 2010, Quality had become ubiquitous in manufacturing and widely deployed in multiple service areas and government. The great accomplishment of the Quality field was the development of new concepts, methods, and tools for demassified Quality control, or the “customization of Quality” that emphasizes service. Quality experts helped to design production systems that automated many Quality control functions. In essence, they have nearly put themselves out of business.

Marcos E. J. Bertin, Firmenich, S.A., Buenos Aires, Argentina:

In Latin America I believe the most important are:

1. *The personal participation of CEOs. The quality professionals will have to learn how to work with very demanding bosses that have to satisfy all stakeholders, therefore requiring companywide strategies. CEOs are increasingly “hands on” regarding Quality, recognizing it as a key success factor.*

2. *The growing importance of computers and communications to improve the efficiency of the company processes. One of the future success factors will be the efficient management of information. Quality is a key factor on this area.*
3. *Last but not least is the evolution of the regional common markets. Europe, NAFTA, Mercosur (Brazil, Argentina, Paraguay, and Uruguay), Andean Pact, Asia, and others. In the future, customs duties, as a trade barrier, will become obsolete. They will gradually be reduced, as a result of the many agreements to come, between the different blocks. But they will most probably be replaced by Standards. For example, ISO 9000, environmental protection, labor practices, technical, etc. These will become the trade barriers of the future and here, the key role of Quality professionals is obvious.*

Let's hope that all the expected changes will result in a better quality of life all over the world. But for this to happen we will have to make a major effort in education, which I consider the key success factor for society.

Hard Times, the second scenario, presents a gloomier forecast:

Due to a failure of leadership to identify convergent, synergistic opportunities, society in 2010 is in a state of near-collapse. The poor, functionally illiterate, unemployed, immigrant, and minority population, confined to drug-plagued inner cities, confronts an affluent upper class. The well-educated, multiskilled professionals and managers with high incomes live in barricaded communities with extensive security or hide away in remote areas.

Economic growth is sluggish, and politicians argue endlessly about why. Deforestation has brought about the spread of deserts and soil erosion. The collapse of fisheries, conflicts over limited water supplies, and other environmental problems are undermining the economies of many developing countries. Ethnic nationalism breeds countless bloody conflicts, ranging from local tribal battles to large-scale, regional warfare.

Quality practice has diminished as the need for survival now dominates most thinking and action. Where it does exist, it is often for appearances sake, but lacks real substance. In the worst case, it is deployed in criminal organizations where Quality professionals now use Quality to “do things better” while failing to “do the right thing.”

Mixed Bag combines many positive advances globally, but predicts an economic downturn in North America:

In the fast-paced global marketplace of 2010, virtually every market is open to increased competition, made possible by error-free products and services. Global restructuring has changed living standards. In nations that were emerging in 1996, new factories and homes are now appearing daily, attesting to these countries’ success in delivering high quality at lower costs than their North American competitors. The result is that most American workers spend fewer hours on the job, and some capable individuals have been laid off and unable to find work. In an effort to address the needs of its people, the United States has once again created escalating national debt.

Quality pervades society, and has become a driver in the public sector, education, and health care. In the field of Quality itself, “deep niche” specialists remain, and in fact, prosper. However, the overall number of Quality specialists has declined, as the number of knowledgeable generalists has grown.

James L. Cash Jr., James E. Robison Professor of Business Administration, Harvard University, Graduate School of Business Administration:

1. *There will be an “order of magnitude” increase in output from the manufacturing sector, combined with an order of magnitude decrease in labor content.*
2. *Distance learning will have revolutionized the “education” industry.*
3. *The United States will have decreased political and economic influence, but increased cultural influence.*

4. *Microbiology will replace the microprocessor as the basis for economic restructuring.*
5. *I will still be two years from retirement and the Social Security system will be bankrupt.*

Designer Nation is the world where everything comes together:

The country emerged from a difficult restructuring with a sense of pride and accomplishment. Trust has been restored in the government, as reforms have eliminated many abuses. Achieving society-wide consensus on national issues has led to improved public policy. The center of power now resides in communities rather than the state or federal government, resulting in reduced costs. Enlightened tax reform has resulted in a distribution of wealth that is less painful, as well as more effective and efficient.

The economy is strong; Quality-driven processes throughout society have dramatically increased the production of wealth. Families now need only one wage-earner. The size of the work force has decreased to 100 million, and some 70 million additional people are now comfortably able to participate in not-for-profit or avocational activities with little or no pay.

Health care and education systems have become much more effective in delivering upon their promises, and access to both is now inexpensive and open to all. As medical problems have been successfully resolved, the senior generation enjoys longer life expectancy—with the emphasis on “enjoys.” Cities are now safer, pleasanter places to live and work, and the land is green and abundant.

The Quality sciences have become universal, and are now the accepted approach for dealing with change. Quality now plays a significant role in strategy development, and the profession both provides and applies new tools in this effort. At the unit operations level of both public and private organizations, knowledge of Quality is widespread. It is used daily by virtually everyone.

OBSERVATIONS AND CONCLUSIONS

Examining each of these scenarios yields a number of observations and conclusions for society as a whole, for ASQC, for members of ASQC, and for those who know they need Quality in their daily work.

Society

A number of observations about the present and near-future seem obvious. It is clear that the rate of change is increasing, and that the information revolution is occurring even faster than had been predicted. Ethnic nationalism continues to increase, and along with it the volatile potential for military conflict. Health care and education are still areas where there is significant need for improvement, and the gap is widening between the “haves” and “have nots.”

For 2010, the observations may not be so obvious. It would appear that Quality will have become an important trend, and thus it's possible to predict that it will be widely known and used, not only in ever-expanding circles of industry, but also in academia, health care, and government. Another prediction is that organizations will become “virtual,” forming around and fixing a specific issue, then dissolving. Multinational organizations will play an ever-increasing role in the world's economy, and will have a truly global reach. Because of both technology and Quality practice, nationwide consensus-building will be not only possible but practiced.

Armand V. Feigenbaum, Ph.D., President & CEO, General Systems Company, Inc.:

No one anywhere in the world wants to travel second class indefinitely anymore—and he or she wants increasingly to be the one to determine what first class means. This is the central driver that our General Systems Company's Global Future Study has determined to be molding the shape and dimensions of the future that we will be facing throughout the next one to two

decades. For international business—a term that will rapidly become an oxymoron within the next several years because there will be no other kind of business for most companies—this is creating the explosive growth of two conflicting forces: One is the rapidly increasing diversity of the expectations of both consumers and business buyers. The second force is the enormous requirement for uniformity in delivering the products and services that meet these requirements because quality—and the buyer affordability and business efficiency that will support it—increasingly will define the size and the form of global markets. Since the expectation for being first class extends also to how people want to work in companies, this places huge new demands for transformation to the kind of organization leadership that builds on the knowledge, skills, and innovative attitudes of employed men and women rather than upon the traditional management approach of getting the ideas out of the boss's head and into the hands of the workers.

ASQC

Analysis of the scenarios and key drivers led us to the conclusion that while ASQC may be well-positioned for today, we are not ready for tomorrow. Reconfiguring for the future will constitute a major challenge to ASQC leadership, starting now. The team recommended change in seven broad areas.

I. Information Technology

ASQC needs to move faster and more comprehensively in understanding and applying information technology. This will be a critical tool for managing the affairs of the Society, and especially for communicating with members on topics of importance either to them or to the Society. ASQC is information-driven. Many of the Society's current commercial offerings are subject to displacement by technology-driven, lower-priced substitutes. Employing appropriate information management techniques and tools may become the major driving force for successfully providing commercial services and products to ASQC customers. Examples might be on-line training, rapid access to Quality-practice data links, and virtual national conferences.

II. Broader Membership Base

The Society needs to be aggressive in seeking new members from new areas and functions. Leading present and future users of Quality technology include health care, education, the public sector, and such initiatives as community-based improvement efforts; all of these should be targeted for membership. By taking a lead role in advancing Quality management and practice in each of these areas, the Society can provide a distinctive service that will be of genuine value to such prospective members. We must deliver flexible, tailored programming to these individuals and others.

There may be even greater potential in appealing to the large number of workers that will use Quality tools and techniques, but do not consider themselves Quality professionals. Meeting the requirements of this very large group could be a major change and opportunity for the Society.

III. Customer Focus

ASQC needs to develop a more robust customer focus that is less solely dedicated to today's products and services and better attuned to tomorrow's more diverse customer and member base. If the areas for opportunity described above are accurate, the Society must become faster and more flexible in responding to individual member or customer needs. Flexibility, empathy, and awareness will replace rigid rules in organizations. The only question is who does the replacing. The byword for ASQC must become "listen."

Jennifer James, Ph.D, Cultural Anthropologist, Jennifer James, Ph.D, Incorporated:

1. *It is not a future with man as a robotic cyborg but with man possessed of new intelligence and new awareness. We will have the freedom to work in knowledge-based organizations at the highest levels of our capabilities.*
2. *Global mobility and communication will release us from many of the*

distortions and absurdities of worn-out myths and historical allegiances. A world market will foster a world brain pool and a world gene pool.

3. *Satellites and telecommuters will create an environment of greater equality, more stable economies, and a less fragmented world. When more people know more, when communication is instantaneous, tyranny will become difficult to sustain.*

IV. Leading-Edge Concepts

If ASQC is truly to be "The Quality Source," we must learn about and champion leading-edge concepts. For example, information technology and systems management are driven by lightening-fast technological change. ASQC must learn how to manage its own change in these areas and must learn how the processes for development of new hardware and software are being improved. By understanding these processes, we will not only benefit the Society, but will also contribute to a critical body of knowledge. Communicating such knowledge to our current and prospective members and customers is an essential requirement of "The Quality Source."

V. Vision, Objectives, Strategies

The current vision of ASQC is to be the world's leading authority and recognized champion on issues related to Quality, and our strategies center on bringing that about in the current environment. The Futures project has made it evident that the current vision, objectives, and strategies must change in order to respond to new forces. The change needs to happen now. At the beginning of this exercise, participants felt a certain comfort with existing plans. Their comfort was increased by the confidence that a lot of time was available to make change. That comfort and confidence are now gone.

We need to be looking now at preparing members to acquire the skills they will need in 2010, at developing business partners for key objectives, at emphasizing regional activities, at applying Quality to

major societal problems, and at other changes that will best address the scenarios of the future.

VI. Governance

ASQC's governance requirements for the year 2010 must be much more responsive to the needs of specific areas (such as health care) or specific functions (such as software development and information operation). While the need to manage the Society as a whole will continue, and probably will become more intense, the real need is to become faster, very responsive, and aimed totally at specific customer or member functions or disciplines. As is true in most of today's organizations, decision-making needs to be moved as close to the action as possible in order to achieve the desired customer focus.

The charter of ASQC asks that members be served and that society be served. The issues to address are how best to achieve the intent of the charter, and how to do so in a way that responds now to the needs of the future.

Brian L. Joiner, CEO, Joiner Associates Incorporated:

- *"Instant," worldwide, broadband, "free" communication.*
- *Increased emphasis on "virtual" companies.*
- *"Instant" customization of products and services.*
- *Incredibly short life-cycles of products.*
- *Substantial increase in numbers working and "living" alone.*
- *Elimination of "middlemen" (not sure of non-sexist term).*
- *Electronics revolutionizes shop floor in manufacturing.*
- *Continuation of population explosion.*
- *Increased level of non-sustainability in consumption patterns with rapidly accelerating pressures to reduce painful effects.*
- *Increased separation of economic haves and have-nots, mostly along knowledge lines.*
- *Decline in disposable income for most Americans.*

Stuart R. Levine, Chief Executive Officer, Dale Carnegie & Associates, Inc.:

It is my belief that the speed of technology, computerization, and global communications will continue to accelerate at a rapid pace. This new information age has the potential to create organizational anarchy and the destabilization of societal behavior as we know it today.

Finding the balance between people and technology will determine an organization's competitive advantage. As information technology advances, interpersonal communication skills will be the art to be mastered by the most successful players. Creating an environment of team performance and recognition are critical components in the battle against isolationism.

Motivating others to work together in a trusting and respectful manner will be the only way for an organization to assimilate all the information available at a given time and thereby increase productivity.

VII. On Becoming an Adaptive Organization

This Futures Study has re-emphasized the idea that there is only one certainty: that change will occur. Some of the change is predictable, but most is not. Being able to forecast the direction of change is helpful. However, being able to adapt to change is the one essential requirement for survival of the organization. In fact, both history and the examination of other systems repeatedly demonstrate that the survivors are those that can observe change and respond to it quickly and effectively.

And so it is with ASQC.

We need to improve our ability to absorb feedback from our environment, make decisions about its implications, act on these, and learn from the results. Speed, a bias for action, and a willingness to act on less than complete information—and thus risk mistakes—describe the drivers for this environment. Developing this capability will determine the future of ASQC.

The Quality Professional

The Quality professional's role will change dramatically. The successful professional in the 1980s and 1990s has taught basic Quality skills and facilitated their use. As a change agent, he or she may have helped to drive fundamental change in organizational structure, and may have assisted in finding new ways for workers to participate and contribute. Some professionals also have been involved in technical applications of manufacturing-oriented Quality approaches, such as design of experiments. While the latter will still exist, it is likely that the number of professionals involved in training and facilitation will diminish as management and the work force integrate Quality tools and techniques into daily work.

In 2010, it is likely that fewer Quality professionals will exist. However, those who do exist will have a new and more complex role. It will involve the development of business-related strategy, using Quality approaches. It will demand superb strategic thinking, information retrieval, communication, and interpersonal skills. The Quality professional of 2010 will probably be much closer to bottom-line results, have a view of how they can be increased, and be much more closely associated with directly improving business results.

An area that is relatively new to some in the field of Quality management is understanding the behavior of large, complex systems. Acquiring and applying knowledge in this area could become very important as technology and new forms of collaboration produce innovative ways of doing business.

What should the Quality professional do today to get ready for tomorrow? Develop leadership, communication, and interpersonal skills, and deepen knowledge of business strategy and collaboration. Understand and use the most appropriate information technology, and stay out in front as new generations emerge. Learn how to have direct influence on bottom-line results. Make a difference in the community.

Perhaps the most important contribution today's Quality professional can make is to society. One challenge is to help teach and

apply Quality tools and techniques in those problem areas that are less well-developed but could benefit most. Any community could be helped; inner cities are in desperate need of Quality.

A second very important contribution is to teach, lead, and set an example today for those who will become the Quality professionals of 2010. Continuing the development of what we know, applying it, and then ensuring that none of the current knowledge is lost as it is passed to the next generation has always been a key responsibility of organizations such as ASQC.

Stan Lundine, Attorney, Former Lieutenant Governor, New York State:

It is striking that there will be a huge jump in the population from 45 to 64 years old. This population currently represents 51.4 percent of all U.S. people, and in 2010, it will amount to 78.7 percent. The other striking demographic aspect will be the increase in people aged 18 to 24 years from 25.5 percent of the population to 30.2 percent. This will represent the next spurt of new households.

In the year 2010, there will be many more female and minority workers. There will be fewer white and more Hispanic, black, and Asian workers. More retirees will be white. There will be fewer early retirements as people live longer, healthier lives. Social Security will be saved. However, as Social Security and retirement savings come up short, more people will work longer and combine retirement and work.

Almost all new jobs will require high skills. It is for this reason I predict the continuance of a very serious income gap. There will be further erosion of the middle class, although it may plateau between 2010 and 2020.

There will be big advances in health care and nanomedicine will use very small mechanisms to target problem spots in our bodies. Telemedicine will grow. By 2010 there will be some sort of universal health coverage for all people in U.S. society. Managed care will have almost completely replaced fee-for-service medicine.

Competitive advantage will increasingly be found in knowledge.

information, and skill. Products will be much more custom tailored to individual consumer design.

Trade will grow much faster than the rest of the economy. The United States will continue to have the largest, most productive economy. China will continue to emerge as a global power—economically, politically, and militarily.

Politically, I would expect that Americans will return to a middle-of-the-road representation. There may be a period shortly after the turn of the Millennium which might be termed “the age of Reform.” Fundamental reforms in fiscal policy, education, health care, crime, and local government organization are likely to occur.

Others Who Know They Need Quality

Every professional, in almost every field, will need to know advanced Quality tools and approaches in order to succeed. In fact, every organization will need to apply the Quality principles, or will be overrun by those that do so successfully.

Four approaches emerged as likely to have value for many professionals. The first recommendation is to use an organizational self-assessment and to create change based on it. A self-assessment, using criteria such as the principles of the Malcolm Baldrige National Quality Award, yields a clear view of present strengths and weaknesses. These provide an essential platform for positive change.

The second recommendation is to learn the basics and key concepts of Quality, and apply them to the organization. Again, a Baldrige-based approach, or one that embodies the Baldrige principles, can be highly productive.

The third recommendation is to understand where the organization must go in order to be successful. This will involve looking outside and understanding where others are going, as well as looking inside.

Finally, as with Quality professionals, those who use Quality must get involved in community improvement efforts. Looking into the future reveals how closely our destiny is linked to that of society as a whole. Our involvement is essential.

A CLOSING THOUGHT

Many of the team members started the Futures Study with the view that this exercise would provoke discussion and allow exploration of a few esoteric areas, and that it would conclude with the writing of a report.

However, it is fair to say that upon completing the task, the collective view of the team is that there is a real need now for rigorous response to the issues of 2010, however they finally emerge. Given the rate of change and the rather high probability that at least some parts of the scenarios will emerge, preparation must begin today. The issue is not so much what will happen, but when. The action required is not what we must do in 2010. It is what we must do in 1996.

Leadership started ASQC after World War II, and leadership has moved the Society through many of the difficult times since 1946. It will be leadership, today and tomorrow, at all levels of ASQC, that will position us for the future—and thus will help to prepare our members and customers to succeed.

Some things never change.

David B. Luther

ASQC Chairman of the Board

May 1996

A P P E N D I X

S C E N A R I O S A N D T H E F U T U R E

*by Clement Bezold, Ph.D., and Atul Dighe
Alternative Futures Associates*

Dealing imaginatively and effectively with the future is critical, but it is seldom easy. Thus, futurists, decision-makers, and planners have developed a wide range of techniques to deal with the future more effectively. By examining trends, composing alternative scenarios, creating a vision, and developing strategies, organizations can better prepare for the uncertainty of the future.

In order to understand the future, an organization must first examine trends, forces that will act to effect the outcome of future events. Furthermore, while trends focus on changes in certain, specific topics over time (e.g., demographics, information technology, governance), additional analysis is needed in order to get a comprehensive picture of what the future may be like. A powerful tool has been developed for considering how interacting sets of trends might lead to a range of conditions in the future—scenarios. Scenarios are compilations of trends that present differing, more comprehensive images of the plausible future.

A scenario is a description of the path into the future taken by a set of interacting forces. Because scenarios are images of the future, they allow us to consider a broad range of possibilities. Scenarios “bound the uncertainty” of the future by defining what is plausible, and what becomes possible if wild cards were to emerge.

Scenarios can be developed in a variety of ways and in varying degrees of detail, but should be both plausible and challenging. Scenarios provide a powerful opportunity to learn both about the future and about our current thinking—including the assumptions and paradigms that we may have become blind to and represent an investment in learning. A scenario should always be “visionary” and push the limits of our thinking to include the trends, threats and opportunities, and wild cards that will shape the future environment.

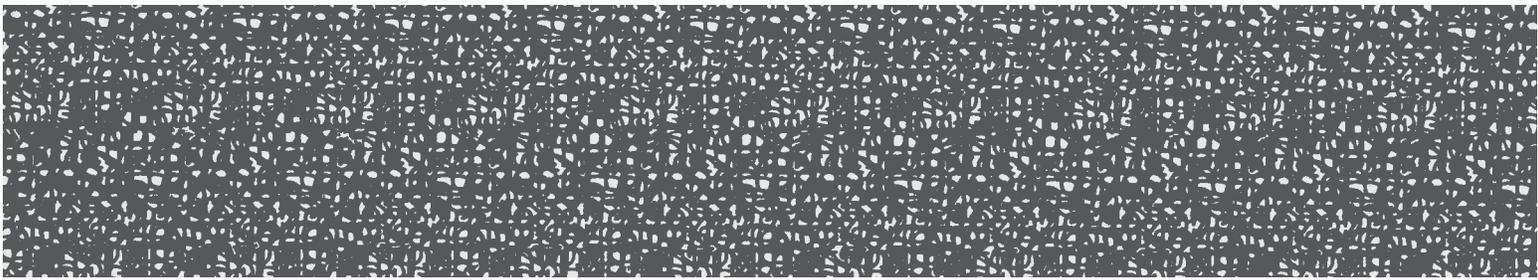
Together a set of scenarios allows users to step beyond the present and explore different patterns of threats and opportunities. In terms of strategy development, scenarios are most often used to stimulate creative thinking and to test the “robustness” of current and potential strategies.

In conclusion, if we accept the basic assumptions that the future is uncertain and that we choose and create major aspects of the future by what we do or fail to do today, then scenarios are a very powerful planning tool. By organizing trends into alternative future scenarios, an organization can begin to bound some of the uncertainty of the future. By using a set of scenarios to test and create robust strategies, an organization can begin to choose and create the future it desires. As such, scenarios can not only help to gain an understanding of the future, scenarios themselves can become drivers in creating the future.



ASQC is a society of individual and organizational members dedicated to the ongoing development, advancement, and promotion of quality concepts, principles, and techniques.

Item B0697



Bringing Quality to the Masses: The Miracle of Loaves and Fishes

How will
workers of the
future learn
about quality?

by
**Gregory H.
Watson**

ONE OF MY MOST REWARDING EXPERIENCES as a member of the American Society for Quality (ASQ) board of directors was serving on the Futures Team. The team was challenged to think futuristically about what the world will be like in the year 2010 and how four possible scenarios could affect the practice of quality. The learning the team experienced during this nine-month project was extraordinary, and the potential implications for the quality community were exceptional. The real challenge was not just to stimulate insight into future possibilities, but to prepare individuals and the quality community for the future. The only way to do this is to ensure that everyone is aware of the trends, changes, and factors that could affect the quality profession.

Over the past two years, the Futures Team has published the study results, and members of the team have described the conclusions at conferences and local sessions. The time has come, however, to discuss specific elements of the study's findings in more detail. What does the future hold for the transition of the body of quality knowledge from quality professionals to the masses?

Interpreting the futures scenario

Scenarios are used to define possible outcomes based on current, observable trends and understand the potential outcomes of future events. One trend that existed across all scenarios studied by the Futures Team was the change that occurs in the quality profession as a result of technology and its impact on knowledge management.

What is knowledge management? It is an approach for sharing knowledge using technology as a creative enabler to evaluate contextual information that incorporates new experiences, resulting in actions that provide unlimited growth potential.¹ In other words, knowledge management is a way to apply technology that links the organization's body of knowledge with the minds of individuals in a current business situation to help make better judgments about potential actions. Quality tools and methods provide an analytical basis for such problem solving. John A. Young, former CEO of Hewlett-Packard, once commented on the reason for making a significant investment in infor-



FRED HILLARD/SIS

mation technology: “By putting a personal computer on each worker’s desk we have created a virtual network for problem solving and sharing ideas across the whole company.” Knowledge management provides a means for linking contextual information about problems with problem solvers using information technology.

How does one prepare for this type of future? There are two foundations that must be developed before the vision of the future can be described. The first is how to transfer knowledge from one person to another applying the principles of adult learning theory. The second is the set of technological enablers that make adaptive learning systems possible. To develop this line of thinking, one must consider the transition of knowledge and the technological enablers of this transition before looking into the crystal ball.

Managing the knowledge transition

A pragmatic question can be asked: Is the future best foretold through the cartoon characters Pogo and Dilbert? As the famous quote from Pogo succinctly states: “I have met the enemy and he is us.” Sometimes people are their own worst enemies. Quality tools cannot be reserved only for quality professionals. These tools are like religious faith; they become more meaningful when they are shared. As the Greek poet Aeschylus said, it is the knowledge of useful things that makes one wise. But, what are the useful things in the body of quality knowledge, and how can technology be used to communicate them in the decision-making process?

Kaoru Ishikawa claimed that 80% of the problems encountered in business could be solved by applying basic quality tools. This thought can be extended by using the Pareto principle to postulate that 80% of the remaining 20% can be solved using advanced quality tools. This means a company could be successful (solving 96% of its problems) when quality tools are used ubiquitously. But, if there are fewer quality professionals in the future organization, who will do the training and how will the organization ensure that its people are knowledgeable in using these tools, both reactively

and proactively?

As Scott Adams, the creator of Dilbert, observed: “All the technology that surrounds us, all the management theories, the economic models that predict and guide our behavior, the science that helps us live to 80—it’s all created by a tiny percentage of deviant, smart people. The rest of us are treading water as fast as we can. The world is too complex for us. Evolution didn’t keep up.”²² This truism, spoken by a dissatisfied customer of the quality movement, implies that quality practitioners will be challenged in transitioning their knowledge to the masses, especially in finding a way to transfer their knowledge so the masses will find it useful in their applications. This means that such application must address the learning principles that apply to adults, which focus on providing new, profound knowledge that is applicable to the task at hand, not knowledge for the sake of knowledge. As Adams observed: “Everything I’ve ever learned in my entire life can be boiled down to a dozen bullet points, several of which I’ve already forgotten.”²³ It can be expected that an organization’s customers will forget what they are told, so what can be done to remind them to apply these tools and methods to their work? This is where technology comes in. Before discussing the technological enablers, however,

remember the solutions that should be avoided.

The extremes of the lone-ranger quality professional, where one individual solves all problems, should be avoided, as well as the Socratic situation, where the quality professional is a full-time teacher of basic skills or team facilitator who doesn’t really want external participation. To be successful in the long term, line managers need to acknowledge and solve their own problems. That way they will take responsibility for preventing the recurrence of such problems. So, how can a future be designed that achieves good for society by applying the quality professional’s skills?

Understanding technological enablers

This problem is similar to the Bible story in which Jesus was faced with a large, hungry crowd and performed a miracle to solve the problem. He fed the masses by multiplying a few fish and loaves of bread into a feast. This miracle illustrates the multiplier effect that quality professionals must create to distribute their body of knowledge to the hungering masses. Fortunately, technology provides enablers that accel-

Preparing for the Future: The Transition of Quality Competence

“The quality professional’s role will change dramatically....In 2010, it is likely that fewer quality professionals will exist. However, those who do exist will have a new and more complex role. It will involve the development of business-related strategy, using quality approaches. It will demand superb strategic thinking, information retrieval, communication, and interpersonal skills. The quality professional of 2010 will probably be much closer to bottom-line results, have a view of how they can be increased, and be much more closely associated with directly improving business results.

“Every professional, in almost every field, will need to know advanced quality tools and approaches in order to succeed. In fact, every organization will need to apply the quality principles, or will be overrun by those that do so successfully.

“For other managers and individual contributors, the knowledge and application of quality tools and techniques will be mandatory. Quality management will be pervasive and integrated into the way things get done every day. Managers will need to undertake organizational self-assessment based on quality principles and be attuned to where both their own organizations and others are headed.”

—Quality, the Future, and You:
An ASQ Consideration of the Year 2010

erate the deployment of quality methods to the appropriate point of application by an organization's internal customers. Which technologies will play a role in this future knowledge management process and allow quality professionals to leverage the lessons learned from their experiences? Consider the following technologies that could enable the achievement of this possible future state:⁴

- **Expert systems.** These are computer programs that capture the knowledge of experts as a set of rules and relationships used for such applications as problem diagnosis or system performance assessment. This technology permits the thought patterns and lessons learned by the "gray beards" to be consolidated and used by "green workers" to evaluate their problems directly. It provides the foundation for many of the smart systems for learning that are part of the crystal-ball system.
- **Relational databases.** These are databases with logical pointers that create linkages among different data elements to describe the relationships between them. This technology permits logical relationships between data elements to be preserved within the operating system for consistent application across the entire organization.
- **Groupware.** This is computer software that allows a number of users to access the same document or program simultaneously. It permits a group of people to create a common document (whether it be a proposal, set of data, or research report) in real time.
- **Agent technology.** This technology permits a surrogate computer program to learn and think like the individual it represents (either a computer user or a master expert). It serves to monitor a preprogrammed set of conditions or adaptively learns what is important to the host by monitoring frequent activities and emulating those that pass a certain test (e.g., the host does this about three times each day, and therefore, the agent will do it continuously).
- **Electronic books.** This technology allows an individual to create a personal electronic notebook that specifies information used on a regular basis. It may be used to compile a personal collection of data or software helpful in certain task-related activities. In its simplest form, the book is merely a text document that is downloaded to a product similar to a personal data assistant, which has smart applications included, such as agent technology that monitors relational databases based on an expert system algorithm.
- **Adult learning theory.** This theory holds that the experience of discovery is the best teacher, and grounding new learning in past experiences is the best approach for getting people to change their behavior. Learning is a process of active inquiry, not passive consumption. Thus, to learn effectively, individuals must learn as part of a larger team that shares their desire to know. Adult learning theory can be applied to individuals in an organization and supplemented by agent technology, expert systems, or individuals who become virtual team members through participation in internal or external networks that are formed based on communities of competence.
- **Contextual information.** This is information that fits a particular context or situation. For instance, when a shipment is made from a factory, certain information becomes relevant. Every time a shipment is made these types of information are automatically linked to form a basic report that is recorded as the activity, along with any exception data that are provided

by monitoring systems, to describe events that occur outside of the regular process.

- **Adaptive systems.** This technology permits a system to learn from data patterns or repetitive situations by monitoring data flows to detect, characterize, and record events that describe the actions to be taken in similar events.

Defining a knowledge system

How can these technologies be integrated into a comprehensive learning system? First, consider an analogy that describes this type of learning system: playing a video game where the participant gets caught up in a virtual conversation with the gaming environment. The challenge in designing a system that permits this type of interactive dialogue is that the prospective audience's reaction can have thousands of permutations in its learning experience. Designing such a computer-based learning machine requires the art of interactive storytelling. In this art, the storyteller recounts a tale, and when the audience responds with a question (or a hiss, boo, cheer, or some other linguistic expression), the storyteller adapts and responds to its stimuli. This type of interaction is less rigid than the print media most people have become accustomed to using for training and expressing thought. A significant difference is that the written media are linear, and the learner must follow the instructional approach of a teacher. Knowledge is gained by imitating the pattern of the teacher. In an interactive session, it is the learner who controls the pattern of learning and determines the sequence, topics, and depth of learning that is achieved. This system supports empowered learning where each person can learn what he or she needs to know and when to apply it to a specific problem. What would this system look like at work?

Looking into the crystal ball

Once upon a future time, a new problem was presented to a competent young manager. He transmitted a broadcast e-mail to his network of collaborators around the company asking if anyone had encountered a similar situation. One colleague suggested he activate Dr. Quality to see what she thought about the situation.

Dr. Quality is the name given to the organization's chief quality agent, who inherited all the knowledge about past problems and appropriate problem-solving methods. Dr. Quality actually has three related agent heads: Joe, Valerie, and Ed. This team specializes in resolving management, engineering, and statistical problems related to the organization's products (goods or services) and processes (work or business). Dr. Quality is invoked (prayerfully, like the oracle at Delphi) to identify the type of situation being experienced or, when a new situation is discovered, to categorize it into a problem type that may be addressed using the generic quality tool kit that was placed in the hands of Joe, Valerie, and Ed years ago by the wise ones of the organization.

Once invoked, Dr. Quality quickly evaluates the adequacy of information for the descriptive event and categorizes the situation based on rules applied from its knowledge base. Analogous problem approaches are identified quickly, and solution methods are sorted for adequacy of information at the current time. When information to support a decision is lacking, Dr. Quality asks the host system of the information owner to conduct a query to provide the missing data and then analyzes the information to determine how to proceed with the analysis needed to

provide a solution to the problem. Once a set of potential solutions is generated, Dr. Quality supervises pilot simulations of the alternatives to test the adequacy of each option. The best simulated solution is presented as the answer. Is this scenario a dream? Well, maybe and maybe not. But, it is one future scenario that could answer the question of how to provide quality training to the masses.

Setting an action agenda

If this futures scenario is to be achieved, then quality professionals and organizations must take some positive steps in this direction. They must sponsor or support research that seeks to establish the technological linkages described here. Many of the basic quality tools and methods can be taught through adaptive learning systems and distributed broadly via the Internet as a point solution to a particular learning requirement defined by a work situation. In addition, the means to characterize problems using standard logical criteria is another area where research is appropriate to determine similar types of problems and may be resolved by similar analytical approaches. A third area for involvement of quality professionals and organizations is in the development of expert systems. When experts retire from an organization, they take with them their expertise. Without this expertise, the system suffers. If the future is to be supported by smart systems such as Dr. Quality, quality organizations need to sponsor or support research that captures this expertise.

Gregory H. Watson is managing partner of Business Systems Solutions, Inc. in Tampa, FL. He is an academician with the International Academy for Quality. Watson is a senior member of the American Society for Quality (ASQ) and the Society's vice president of research and technology. He was instrumental in developing ASQ's technology plan following his participation in the ASQ 1996 Futures Project.

Copyright 1998 by Business Systems Solutions, Inc.

References

1. Thomas H. Davenport and Laurence Prusak, *Working Knowledge: How Organizations Manage What They Know* (Boston, MA: Harvard Business School Press, 1998), pp. 1-14.
2. Scott Adams, *The Dilbert Principle* (New York, NY: HarperBusiness, 1996), p. 9.
3. Ibid, p. ix.
4. Gregory H. Watson, *Business Systems Engineering* (New York, NY: John Wiley and Sons, Inc., 1994), pp. 3-16 and pp. 126-138.

What did you think about this article?

Quality Progress needs your feedback. On the postage-paid reader service card inserted toward the back of this magazine, please circle the number that corresponds with your opinion of the preceding article.

Excellent	Circle #325
Good	Circle #326
Fair	Circle #327
Poor	Circle #328



Digital Hammers and Electronic Nails— Tools of the Next Generation

Editor's Note: This is the second of three articles by Gregory H. Watson on the evolution of the quality movement. Watson, vice president of research and technology for the American Society for Quality (ASQ), was instrumental in developing the Society's technology plan following his participation in the ASQ 1996 Futures Project.

**“I am wandering between two worlds, one dead, and
the other powerless to be born.”**

— Mathew Arnold, British poet, 1822-1888

Successful
future
companies
will use
relevant
information
to beat their
competition.

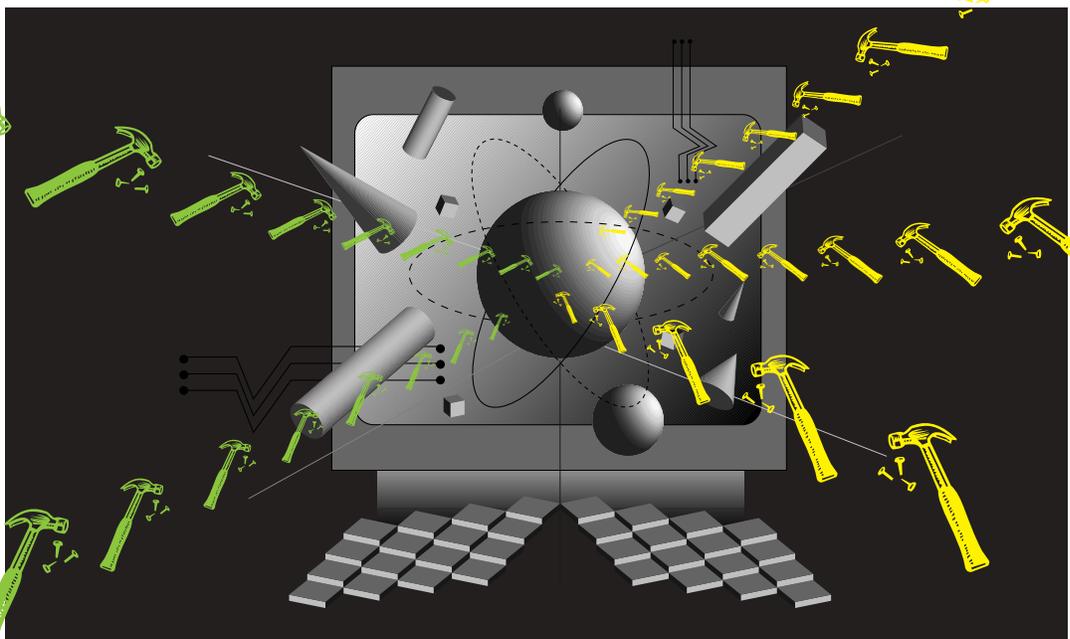
ONE OF THE FORCES DRIVING THE CONCLUSIONS of the American Society for Quality Futures Study was globalization stimulated by shrinking boundaries among businesses due to electronic commerce.

In the coming millennium, the effect of technology on the success of all businesses, not just the large multinationals, will be significant. Even a small business can benefit from advanced technology. A friend of mine, Ian Prosser, owns a small floral shop in Tampa, FL, named Botanica International Florist. Europeans who are coming to Florida to get married call him. Technology, specif-

ically the Internet, has transformed his business. International orders from his Web site match the orders from local customers. Through the magic of software and electronic commerce, his individual business can appear to be as large as General Motors or Florists' Transworld Delivery (FTD).

Today, we are routinely confronted by change. But most of us are unable to tell the difference between changes that merely present a mild inconvenience in our daily lives and changes that revolutionize the way we work. As Arthur C. Clarke once said, “Any sufficiently advanced technology is indistinguishable from magic.”¹ The role of technologists is to innovate new products and

by
**Gregory H.
Watson**



applications developments that keep the magic going. But for nonmagicians, this is a most disturbing world with disappearing buildings and floating tigers, not to mention quarters that appear out of thin air.

How can we become settled and live successfully in such a magical world? We must learn to embrace change—to seek it and not be afraid of a new and different world. As John A. Young, former CEO of Hewlett-Packard, decreed in 1985, “If you’re going to be successful in the electronics industry, then you’ve got to learn to love change. If you don’t like change, then you should go into the beer industry where the most successful beer makers work hard to preserve the traditions of the master brewers.”² However, with today’s microbreweries and other innovations, it appears that change may have penetrated even those hallowed halls. The truth is that no business is immune from change that is stimulated by new technology.

Business factors in the knowledge age

Peter Drucker christened this new age, in which information is a dominant factor, as the “knowledge age”—a time when the economic value of knowledge is becoming greater than the economic value of durable goods. In this age, the act of creating new knowledge will be synonymous with designing a new product. People will be valued for what they know, not just what they do. Information will become a freely trad-

ed commodity, just as food and consumer electronics have been.

In this future age, wars may be fought over copyright, trademark, or patent violations, instead of border disputes. As Nicolas Negroponte, director of the Massachusetts Institute of Technology media lab pointed out, “Being digital is to reflect on the difference between bits and atoms.”³

The future of the business world will not be in physical trade, reflected by our current trade policies, but in electronic bits that store the knowledge that is

central to an information economy. The physical world (atoms) will be less important than the world of ideas (the electronic world of bits).

What is the character of the emerging world? One premise is that successful future companies will take advantage of their knowledge bases of intellectual property and will seek to find ways to use this property to better serve their customers.

The most successful companies in this knowledge age will integrate quality thinking into their business model, creating a holistic, or integrated, enterprise. Many of these critical success

factors come from successful quality management and can be summarized as:

- **Vision directed.** Closing the gap between the current state of the business and the vision if its future is the strategy of the organization. The mutual understanding and support for the organization’s vision are required to harness the energy of its members to pursue the greater goal of organizational success.
- **Values driven.** The organization’s common culture and shared set of beliefs build collaborative, committed relationships among its stakeholders—both internal and external—and networks among unrelated businesses that share common interests.
- **Customer focused.** The organization exists to serve its customers and considers customer expectations and feedback in all phases of its business life cycle—from new product development to field service. The voice of the customer is heard clearly and used as a compelling source of information about what products to design and what changes need to be made in the organization’s customer service model.
- **Process controlled.** All work is managed as processes that are not only documented and measured, but use the in-process measures to guide the operation so that outcomes meet targeted results. Adaptive feedback and control mechanisms are one element of the information age that has been around for some time, but will grow in sophistication and application as technology becomes more advanced.
- **Team based.** Putting two heads together has been demonstrated to be better than having a single head dedicated to a problem. Teamwork will continue to be required—even in the way that future factories will be designed. According to the tongue-in-cheek prediction of management consultant Warren G. Bennis, “The factory of the future will have only two employees: a man and a dog. The man will be there to feed the dog. The dog will be there to keep the man from touching the computer.”⁴ Now that’s the ultimate in teamwork.
- **Quality engineered.** Work processes will be quality engineered to prevent defects in output, reduce cycle time and waste, and eliminate lost productivity. The companies that take these steps forward move closer to a goal of six sigma operation—working at a level where problems are a rarity because failure opportunities have been both anticipated and eliminated at the process design stage through the application of advanced quality methods.
- **Technology aided.** Organizations have come to realize that technology is not a panacea, but can provide a competitive differential when applied to an organization that has its processes controlled and quality engineered. Technology for the sake of technology did not prove itself, as General Motors demonstrated by its 1980s-era investments in automated factory equipment projects that did not make any impact on its bottom-line financial or market performance. In the final analysis, appropriate technology used at the appropriate time will win.
- **Results oriented.** Organizations will be focused on achieving the results described in their visions. These results will be defined in the strategic plan, and all action plans will focus on delivering the long-term result—the vision—while meeting the short-term commitment to financial goals required by stockholders.

...SUCCESSFUL
FUTURE COMPANIES
WILL TAKE ADVAN-
TAGE OF THEIR
KNOWLEDGE BASES
OF INTELLECTUAL
PROPERTY AND WILL
SEEK TO FIND WAYS
TO USE THIS PROPER-
TY TO BETTER SERVE
THEIR CUSTOMERS.

New sources of knowledge, new sources of competition

Although most quality professionals have dedicated their careers to microeconomic considerations—the business of a firm—the quality professionals of the future must concentrate on a more macroeconomic world, a world that is affected by global politics and emerging sources of business competition. We will not only be concerned with what our historical competitors are doing, but also with what potential, or latent competitors—those with the resources and capability to compete against our firm if they should so choose—are going to do.

Years ago, the United States Postal Service and the United Parcel Service (UPS) had a friendly monopoly on the transportation of packages within the United States. Competitors, including FedEx, arose, along with the rise in popularity of the fax machine. FedEx has been a direct competitor focused on the movement of “atoms” for business. The fax represents the movement of “bits” and is a competitor of a different sort. FedEx also directly competes against airlines, representing the old way of doing things—moving physical packages. The fax machine is a competitor of a different type—a virtual competitor that has been spawned from technology to move virtual packages such as documents and mail via the Internet and World Wide Web. The Internet takes this competition one step further toward electronic communication of knowledge, as represented by documents.

In the knowledge age, competition can come from a variety of unanticipated sources because it will be easier to compete when the traded commodity is “bits of knowledge” rather than the physical presence of a product. These companies must consider the possibility of virtual competitors. As Joel Barker has preached for over a decade, “What would happen if an excellent company shifted the paradigm of business and discovered a completely different way of doing things?”⁵ The digital world provides just the sort of mechanism that companies can use to change the paradigms of their business models.

Meaning for quality professionals

Many of the old paradigms that have been part of the quality profession will shift over time as the digital representation of the world becomes more important to our lives. What does this mean for the quality professional?

For one thing, we cannot act like ostriches and put our heads in the sand, pleading technological naivete or fear of technology. We must face this emerging technological world head-on.

Mikel J. Harry, founder of the Six Sigma Academy, often preaches to people he trains as black belts: “We don’t know what we don’t know.”⁶

In the future, we will be able to collect and access data so easily that we will be tempted to analyze the data that are easy to obtain, which is not necessarily the data that we need to characterize the performance of work systems. This means that we must become more proficient in sorting, searching, and converting data to meet our requirements, rather than taking the easy way out and producing reports because data are readily available.

Care will be required to identify meaningful measurements that provide actionable findings.

Bill Gates has observed: “The computer is just a tool to help in solving identified problems. It isn’t, as people sometimes

seem to expect, a magical panacea. The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second [rule] is that automation applied to an inefficient operation will magnify the inefficiency.”⁷

Gates’ statements or rules seem to reinforce the need for process management and problem solving in the world of the future—two of the fundamental roles of quality professionals.

How is our world going to change as the knowledge age approaches?

What are the social shifts that are changing today’s world and will have far-reaching effects in the future? We need only read the headlines of the *International Herald Tribune* or watch CNN’s world news to become aware of some of the major trends that are changing today’s world:

- Social democracy has become accepted as the most acceptable form for governance across the world. This proliferation brings with it an emphasis on the choices of individuals and their ability to determine what they want for themselves—two of the essential ingredients of a free-market economy.
- The free-market economy has become the norm as regional groups band together to gain economic strength and ensure that their part of the world will be fully competitive in the future. Consider the European Economic Union and the North American Free Trade Agreement as two illustrations of this. Today, almost all global markets are represented by such collective bodies.
- Telecommunications deregulation has been a global trend with two related outcomes. First, the proliferation of national telecommunications providers is leading to consolidation. A few global providers are emerging that are capable of making the significant investments in the infrastructure required to support the digital world. Second, the national focus on regulation of these global entities has become meaningless as they become cross-national entities whose operations reach far beyond the jurisdiction of any national body. This means that individual nation-states will have less influence or control over what information is available to their people, furthering the influence of the social democratic principle of equal access to information.
- Technological breakthroughs will continue to be introduced

...THE QUALITY PROFESSIONALS OF THE FUTURE MUST CONCENTRATE ON A MORE MACRO-ECONOMIC WORLD, A WORLD THAT IS AFFECTED BY GLOBAL POLITICS AND EMERGING SOURCES OF BUSINESS COMPETITION.

to society. In a recent product announcement, Intel claimed that Moore's law (each new generation of microchip electronic memory will have twice the capability of the prior generation at half the cost) is dead. It is working on producing new technology that will multiply, not double, capability.

This trend has enormous implications in quality and process-control applications. As computer processing power and speed of access to data increase, so do the complexity of the problems analyzed and the number of sources for data.

This is due to the interconnection capability that extends beyond a single machine to a factory floor and beyond. This increase in problem complexity and interconnection density for data sources may preclude the use of traditional quality control techniques and push the envelope to new areas for information processing and data transformation.

...WE MUST
BECOME MORE
PROFICIENT IN
SORTING,
SEARCHING, AND
CONVERTING
DATA TO MEET
OUR REQUIRE-
MENTS, RATHER
THAN TAKING
THE EASY WAY
OUT AND PRO-
DUCING REPORTS
BECAUSE DATA
ARE READILY
AVAILABLE.

- One trend offsetting consolidation tendencies resulting from the spread of social democracy is the emergence of strong cultural and religious identification that is evident in many of the local conflicts that exist within our world. The building of a unique ethnic and religious identity is a reaction to the fact that most of us resist being in boxes that all look just the same.
- Despite this need for a unique identity, there is a strong movement toward standardization of business practices. Standardization is necessary when the hardware and software that different companies produce must work together in a single operating system—as occurs in the open system architecture for computer systems—or when the operations of business processes must work across the boundaries of

collaborative firms. Standardization will no longer become the job of a few individuals with esoteric technical backgrounds. It will become the “real politik” of the geopolitical world.

- Electronic commerce and global communications will change the way we work and live. They will provide business capabilities among individuals and companies that could not have existed previously. They will be an outgrowth of networks, special interest groups, forums, and chat groups and will provide the means to establish

new economic entities that had not been considered previously.

What will be the outcomes of these social shifts? No prediction can be completely correct, but the roots of the future can be observed in the past. We can chart a future view that is roughly right from our historical perspective. Some projections include the following estimates:

- Economic entities will be more important to the world than will be the individual nation-states. Although the types of economic entities will most probably change, they will likely rise to dominate the nation-state in influence.
- Regional trade affiliations will be more important than national political associations.
- Cultural and religious preservation will remain a strong counter-current to mainstream changes.
- Global businesses will influence international relations more strongly than the political agendas of local and national governments.
- Technology access will be critical for economic growth.

How will technological change influence our work in the near term?

Because information technology will become critical for business, it is most important for us to understand its future. Information technology consists of two categories that will ultimately converge and drive many business realities:

- **Telecommunications technology and the Internet.** This technology consists of wide-area networks (including the Internet), telecommunications protocols, data transmission technology, and network management systems that assure both personal privacy and economic security. The convergence potential of telecommunications technology comes from the choice as to where intelligence should be located—on the network or at the control of the user?

This choice is not as straightforward as it seems. We already have given up personal choices to computer systems that select news articles for us to read, determine when a security check needs to be made based on our buying habits, and sort our incoming messages for significance.

- **Personal computing, networks, and thought machines.** This technology includes such elements as personal computers, high-speed modems, optical storage devices, artificial intelligence, agent technology, relational databases, local-area networks, and groupware computing environments. The potential convergence for personal commuting with telecommunications comes from the merging of computer technology with modems, cellular phones, and personal data assistants in order to integrate our personal information environment.

These two technologies may be on a potential collision course, and many businesses that support these technologies may become candidates for mergers and acquisitions as multinational companies seek to position themselves to dominate global market share of these highly valuable technologies. Consider what the outcomes of these techno-shifts will mean for businesses:

- Automated, real-time access to business data and information sources will be available to monitor business developments as they occur, taking much of the guesswork out of decision making and eliminating time lags that occur due to

- end-of-the-reporting-period delays.
- This extensive access to information will pressure management teams to urgently develop new goods or services that not only meet the observed requirements of customers, but also anticipate their desires. Time-to-market improvements will be insufficient because customers will become aware of opportunities much more rapidly.
- As the knowledge of competitors' actions emerges, the faultless execution of strategy and enhanced productivity of operations will become the battle trenches for business. No time will be allowed to correct design or operating problems or to correct a misperception of the market.
- As product offerings merge and lose their distinctive quality, the level of service that an organization offers will become a critical product differentiator.

How do these techno-shifts change the work of quality professionals?

We should begin thinking about the future of the world by observing that the various disciplines of management (planning, finance, marketing, engineering, operations, personnel, information systems, and quality) have taken different paths in their evolution. It should not be surprising that the practitioners of these disciplines have developed unique cultures, values, and vocabularies in their efforts to coexist as an identifiable vocation within the milieu of the organization.

This, however, creates the problem that drives top management crazy—management becomes wrapped up in the care and feeding of its function while ignoring the greater-value business processes that deliver value to external customers.

The organization that reinforces functional thinking in the vocational subcultures therefore perpetuates this strong disconnect and builds high walls that serve as boundaries to the free flow of the business. The organization of the future will eliminate these boundaries through the appropriate application of technologies.

Virtual presence through teleconferences and videoconferences eliminates much business travel, with its time lost from work and often aggravating and frustrating side effects. However, it is not clear that a company will just make a few technology purchases and then walk into the new era. As Soshana Zuboff has said, “Unless informing is taken up as a conscious strategy... it is unlikely to yield up its full value. The centerpiece of such a strategy must be a redefinition of the system of authority that is expressed in and maintained by the traditional ... division of labor. The informing process sets knowledge and authority on a collision course. In the absence of [a] strategy to synthesize their force, neither can emerge as a clear victor, but [and] neither can emerge unscathed.”⁸

Knowledge and authority confront one another. This transition requires leadership and planned change. Teamwork and groupware drive knowledge to the lowest level of authority and the driving forces that encourage an organization to consider restructuring its decision-making processes. This pushes the decisions down to the lowest level of authority, where the information is best understood, and in most organizations this is the true meaning of empowerment. So, what will be the impact on quality professionals?

- Greater access to information will mean that any failure of a

company with one customer will be visible to all customers and could appear to be a major failure. Greater emphasis will be placed on faultless delivery of products and services to customers.

- Getting products right during their design will be a priority that gives added emphasis to reliability engineering for both hardware and software products.
- Maintaining predictable manufacturing processes will increase emphasis on process characterization, monitoring, control, and adaptive correction systems.
- The need to understand the voice of individual customers will expand the use of statistical sampling and analysis techniques in the survey of customers and will drive companies to use direct customer communications as the primary vehicle for collecting and analyzing customer data.
- Micro-marketing of information will be required to understand how customers perceive each moment of truth in their relationship with their supplier-partner organizations. Not every moment of truth is conceived equally in the eyes of customers. Some provide a much stronger competitive discriminator than others, and it will be necessary to measure these moments, monitor their performance, and prioritize service quality improvement efforts to ensure that the most dominant competitive discriminators yield differentiated performance.

Some of the trends that will change the way quality professionals work in the future include:

- The technical content of our work will increase. Does this mean that quality will merge with information technology?
- The breadth of a professional's expertise will be highly valued. Does this mean that quality will merge with industrial engineering?
- Human interaction will become more important to the success of individuals who work in this field. Does this mean that quality will merge with human resources?
- The importance of strategic thinking will become a critical differentiator between those quality professionals who are focused on an ever-increasing technological profession and those whose breadth and depth of knowledge earn them a place at the top management table as executive coach and team facilitator on strategic matters.

Although it is unclear what potential professional consolidations will take place in the future, it is significant that each of these proposed mergers represents a choice that already has been made by at least one *FORTUNE* 100 firm over the past few years. To prepare ourselves for such events we should act in accordance with the observation of author H.G. Wells, who said in 1920, “Human history becomes more a race between education and catastrophe.”⁹ We need to educate ourselves to avoid catastrophe.

How will these changes affect the competitive advantage of your firm?

The new knowledge age and digital world will bring forth its own rules for competitive businesses. Some of these rules are extensions of the past that we can be sure will play a role, while others will need to be discovered during the trials of life. A few that appear to be relevant include:

- First to market with the best product will win. All product development will compete simultaneously on both time and

excellence parameters. Complicating this trend, the first to achieve acceptance as an industry standard further wins because everyone else will need to pay them homage in terms of royalties and license fees or decide to sit out a generation of product technology in the hope of riding the next wave.

- Business process benchmarking, technology assessment, and strategic planning will become an “evergreen” or continuous process of significant value to top management.
- Reaction time in work processes will become a synonym for lost business. He who hesitates will be lost. At Motorola, former chairman Bob Galvin rated his managers on their ability to anticipate trends and commit to new ways of working. Response speed will be of the essence in winning the future customers’ loyalty.
- Value-chain thinking extending to global alliances, collaborations, and other types of partnering will become the common wisdom in organizational development.
- Innovation and information savvy will be the treasured skills of the next generation of managers.
- Continuous learning will be needed to provide the firm with exposure to innovative ideas and options for strategic choice.

In his book *The Road Ahead*, Gates said, “Education is society’s great leveler....Part of the beauty of the electronic world is that the extra cost of letting additional people use educational material is basically zero.”¹⁰ This means that as technology continues to change, we must create a robust means to educate people about how that change will affect them and give them the tools that prepare them for the new future.

Because the rate of technological change will likely continue to accelerate, we must create an ability to anticipate change, integrate new concepts into our business models, and build on proven work processes. These will be the critical success factors for achieving and maintaining operational excellence in the knowledge world.

As is true today, the reliance on competent people and use of business alliances and partnerships to extend the capability of our firms will be fundamental keys to success. In order to achieve this level of performance, both executives and quality professionals will need to become technologically astute to lead their firms into the 21st century. We must learn to wield digital hammers and use electronic nails—the tools of the next generation.

The great British statesman Winston Churchill forecast in *Onwards to Victory*, “The empires of the future are the empires of the mind.”¹¹ We must prepare ourselves for the new competencies of quality to have a leadership role in the future.

So, what should we do on Monday morning when we get back to the office? We must ask two questions: How do we influence our colleagues to think strategically and focus on developing the skills that will be needed in this future, and what are these skills that will be required?

Copyright 1998 by Business Systems Solutions, Inc.

Acknowledgment

The author wishes to thank A.H. “Jack” West and Deborah L. Hopen for their assistance with this article.

References

1. Arthur C. Clarke, as quoted by Laurence J. Peter, *Peter’s Quotations* (New York, NY: Bantam Books, 1997).
2. John A. Young, in a speech to the Chevron management team, March 6, 1987.
3. Nicolas Negroponte, *Being Digital* (New York, NY: Random House, 1995).
4. Warren G. Bennis, as quoted by Louis E. Boone, *Quotable Business* (New York, NY: Random House, 1992).
5. Joel Barker, *Paradigms* (New York, NY: Harper Collins, 1993).
6. Mikel J. Harry, *The Vision of Six Sigma* (Phoenix, AZ: Six Sigma Academy, 1995).
7. Bill Gates, *The Road Ahead* (New York: Viking Penguin Books, 1995).
8. Soshana Zuboff, *In the Age of the Smart Machine* (New York: Harper Collins, 1988).
9. H.G. Wells, *Outline of History* (New York, NY: Somerset Publishers, 1920, 1974).
10. Gates, *The Road Ahead*.
11. Winston S. Churchill, *Maxims and Reflections* (New York, NY: Barnes and Noble Books, 1994).

Bibliography

- Ciborra, Claudio U., editor, *Groupware and Teamwork: Invisible Aid or Technical Hindrance?* (New York, NY: John Wiley & Sons, Inc., 1996).
- Dyson, Ester, *Release 2.0: A Design for Living in the Digital Age* (New York, NY: Broadway Books, 1997).
- Gates, Bill, *The Road Ahead* (New York, NY: Viking Penguin Books, 1995).
- Hogan, James P., *Mind Matters: Exploring the World of Artificial Intelligence* (New York, NY: Ballantine Books, 1997).
- Moschella, David C., *Waves of Power: The Dynamics of Global Technology Leadership 1964-2010* (New York, NY: AMACOM, The American Management Association, 1997).
- Negroponte, Nicholas, *Being Digital* (New York, NY: Vintage Books, 1995).
- Rawlins, Gregory J.E., *Moths to the Flame: The Seductions of Computer Technology* (Cambridge, MA: The MIT Press, 1996).
- Shurkin, Joel, *Engines of the Mind: The Evolution of the Computer from Mainframes to Microprocessors* (New York, NY: W.W. Norton & Company, 1996).
- Wang, Charles B., *Techno Vision: The Executive’s Guide to Understanding and Managing Information Technology* (New York, NY: McGraw-Hill, 1994).

Gregory H. Watson is managing partner of Business Systems Solutions, Inc. in Tampa, FL. He is an academician with the International Academy for Quality. Watson is a senior member of the American Society for Quality (ASQ) and the Society’s vice president of research and technology. He was instrumental in developing ASQ’s technology plan following his participation in the ASQ 1996 Futures Project.

What did you think about this article?

<i>Quality Progress</i> needs your feedback. On the postage-paid reader service card inserted toward the back of this magazine, please circle the number that corresponds with your opinion of the preceding article.	Excellent	Circle #337
	Good	Circle #338
	Fair	Circle #339
	Poor	Circle #340

The Emancipation of Quality: Building Bridges and Closing Gaps

Editor's note: This is the third of three articles by Gregory H. Watson on the evolution of the quality movement. Watson, vice president of research and technology for the American Society for Quality (ASQ), was instrumental in developing the Society's technology plan following his participation in the ASQ 1996 Futures Project.

In a time of drastic change, it is the learners who inherit the future. The learned find themselves equipped to live in a world that no longer exists.

—Eric Hoffer

Offering
quality
to the
masses—
celebrating
our lack
of control

by
**Gregory H.
Watson**

THE AMERICAN SOCIETY FOR QUALITY IS now free of C—it is out of control—free from the restricting perception that the Society cares only about the technical aspects of quality control found in manufacturing applications.

Does this emancipation mean that the Society should no longer care about a focus that represents its tradition of the past 50 years? No, what it means is that the practical definition of quality has been broadened from an emphasis on manufacturing quality control to all work and organizations. Quality no longer applies just to work; now it also has a prominent place in other aspects of people's lives. The principles and tools of quality help people conduct meetings, define problems, interpret data, and make decisions, whether we are working with the Girl Scouts, our school system, or our church group.

The Society's name change reflects the change that already has occurred around the world. It is a sign that ASQ recognizes and accepts this broader application of quality. Quality is not just a subject for technical professionals; it now belongs to the masses.

The future requires a changing role for quality professionals, who must facilitate quality's application in all environments and situations. In its Futures Project, ASQ discovered its responsibility to help its members prepare for a future that will be driven by technology and the integration of quality methods into all tasks:

"Every professional, in almost every field, will need to know advanced quality tools and approaches in order to succeed. In fact every organization will need to apply quality principles, or will be overrun by those that do so successfully. Those who use quality must get involved in community improvement efforts. Looking into the future reveals how closely our destiny is linked to

that of society as a whole. Our involvement is essential."¹

Quality concepts and tools will be used everywhere in society to improve the quality of products, services, and life.

What are these basic skills of quality management that will be deployed so universally? They include problem solving, process analysis, data collection and analysis methods, process auditing, and teamwork. In addition, some of the advanced quality tools, such as design of experiments, quality function deployment, and failure mode effects analysis, will be used by professionals in many other fields.

What will be the role of today's quality professional? One conclusion in the Futures Project was that quality professionals will generally be fewer in number and will be more involved in strategy development.

What does this mean to you, the quality professional? It means communication, strategic thinking, information retrieval, and interpersonal skills will be essential to your work. You will get involved in strategic business opportunities to apply your skills to higher-level projects and broader responsibilities. Any quality professional who wants to be active in the future must take a leap in that direction now, preparing to wield digital hammers and use electronic nails, the tools of the shrinking global marketplace.

Making the journey one step at a time

So what should you do now to begin the journey to the future? How do you influence your colleagues to think strategically, focusing on developing the skills that will be needed in the future?

ASQ's first step in the journey involved building scenarios for analysis of what might happen. Scenario planning provided alternative views of potential future events. It is not the accuracy of the

scenario or the relevance of its outcome that is most important; it is the ability to plan and implement a transition from the current condition to the future that is most important.

Once this gap was estimated by the Futures Study Team, current practices were extrapolated to determine what actions are required to move toward the desired state—in this case to the situation where basic quality is being used throughout society, advanced quality methods are integrated into all professions, and quality specialists have developed new competencies.

The extrapolation indicated that the business of improvement would be focused on adding value to the corporation and that three possible strategies seemed most likely: improving human skills, technical skills, and problem-solving skills. In other words, three transitions will have occurred based on this extrapolation: the transfer of knowledge from quality professionals to the public at large, the transfer of knowledge from quality professionals to all professionals, and the development of new competencies by quality professionals.

Most important for the profession, quality professionals will become the key problem solvers of the management team, attacking the chronic issues that the organization must conquer in order to succeed. This means that the quality community must embrace two critical factors for sustained success: technical competence and accountability for outcomes.

Step 1: Thinking strategically, acting tactically

Business success depends on management thinking in a strategic dimension and acting in an aligned tactical dimension. This increases the value of the owners' or shareholders' investment, as measured in financial terms, such as return on net assets, earnings per share, return on investment, return on capital employed, operating profit, and cash flow.

These indicators also demonstrate the company's value to customers because sustained levels of financial excellence require that the purchasing criteria of customers be met continuously.

Financial measures of global performance, however, are lagging indicators of performance because they show what has happened in the past and do not help an organization to anticipate problems or to understand changes in its business model as that change is happening. More helpful for management are leading indicators that can predict future results from today's actions.

The measurement system should be able to predict changes in financial success based on changes in daily work processes. An excellent system for performance management measures work processes in a way that predicts the organization's overall performance capability.

These performance measures are linked by cascading objectives that deliver the predicted outcome by aligning activities across the organization. They include a coordinated set of metrics from top-level indicators to the frontline measures of process performance.

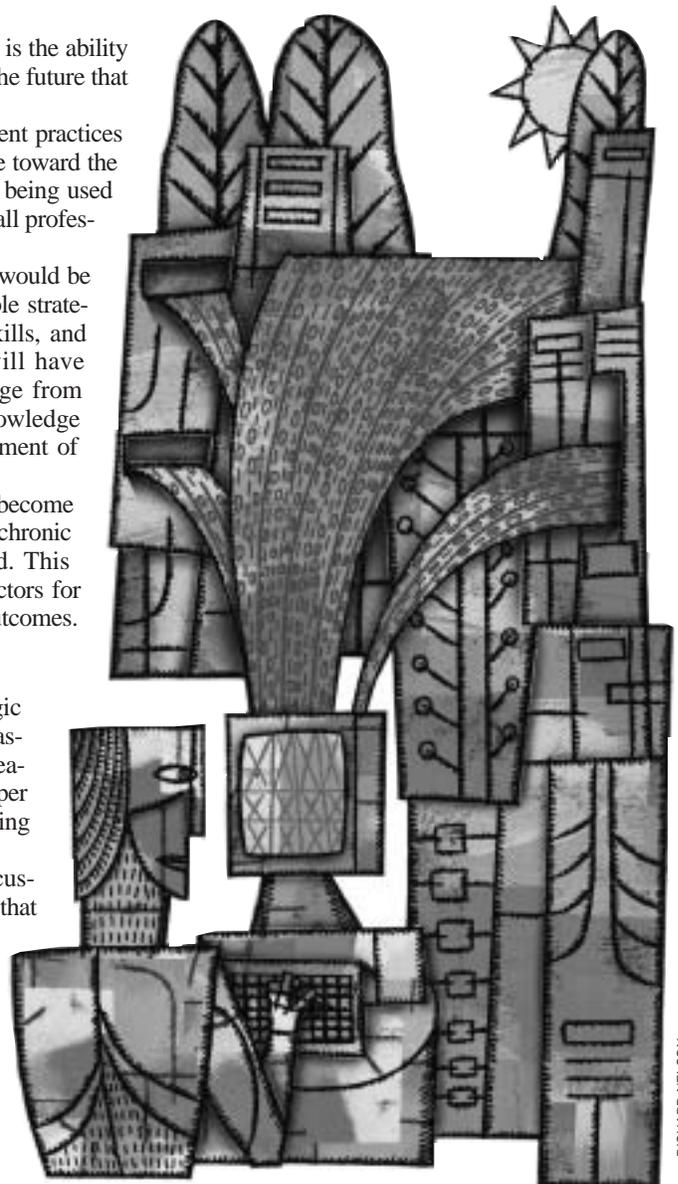
Likewise, business success becomes a function of managing the daily work processes, applying control points to optimize cycle time and output quality, and challenging process owners to operate at the lowest possible cost while optimizing performance of the entire business system. How is such excellence in work process performance delivered on a regular basis?

The universal process of management consists of three subprocesses that define the sequence of actions taken to perform work: planning, control, and improvement. These three subprocesses operate together to optimize the performance of a work process, which leads to the attainment of business objectives. It is, therefore, necessary for future quality professionals to be able to

assist with all three subprocesses.

Most businesses rely on three key processes: product creation, product delivery, and management. Planning is required for all three to occur effectively and efficiently. Project management, logistics management, and annual strategic action planning are all integrated into these systems. All of these also use comparative analyses: product creation uses competitive product analysis and process benchmarking, product delivery uses competitive market analysis and process benchmarking, and management uses competitive customer satisfaction, technology assessment, and process benchmarking.

Control guides the appropriate adjustment of the work in the face of process variation that



RICHARD NELSON

Behaviors Leading to Success

In a study sponsored by a Fortune 500 company, the following behaviors led to success for quality professionals:

- **Customer-orientation.** Focus work on understanding and meeting the needs of external customers.
- **Customer advocacy.** Aggressively represent the perspective of the customer to internal associates in order to improve work activities and achieve acceptable solutions that improve customer relationships.
- **Organizational astuteness.** Work across functional boundaries and build collaborative relationships by developing shared goals based on mutual benefits; anticipate and recognize the implications of actions and decisions on organizational agendas and business strategies.
- **Influence.** Get others to accept new ideas and obtain support for own ideas; gain the trust of others; modify personal style or approach to achieve desired outcome; present ideas and facts in a convincing manner.
- **Interpersonal diagnosis ability.** Identify, understand, and accept different types of people, their skills, and communication styles; exercise self-control in emotionally sensitive circumstances and defuse confrontational situations.
- **Goal orientation.** Seek out and set challenging goals and demonstrate ability to achieve significant results; challenge status quo; have the will to win without putting self-interest first.
- **Persistence.** Follow through until problems are resolved or actions are implemented satisfactorily in spite of resistance or difficulties.
- **Planning and organization ability.** Organize and execute projects and activities in a way that optimizes resources while accomplishing the desired results; set appropriate objectives for self and others in order to achieve organizational goals.
- **Ability to mentor subordinates.** Define associates' developmental needs relative to the organization's needs and opportunities; assist others in developing their aptitudes, skills, and competencies; coach and identify experiences that provide opportunities for self-discovery and learning.
- **Collaborative ability.** Promote common goals to build cooperation among diverse individuals and organizations.
- **Initiative.** Seek opportunities and originate ideas and actions; seek relevant information about problems; adapt new methods, skills, and approaches; accept suggestions from others; take calculated risks to achieve specific business benefits.
- **Professionalism.** Identify problems and resolve issues by rapid implementation of workable solutions; have capacity to work hard over an extended period of time with excellent results, despite the pressures and stress; continuously extend knowledge in professional and business areas; recognize personal developmental needs and seek learning opportunities for personal development.
- **Conceptual ability.** Assimilate and understand abstract numerical and verbal information; analyze complex issues and draw logical conclusions based on priority of importance.
- **Innovativeness.** Generate and introduce new ideas, models, and methods that result in performance improvement; develop imaginative and creative solutions; be able to replace traditional work methods with totally new methods that increase productivity.
- **Communication ability.** Share information and data with team members; express concepts effectively in writing or orally with appropriate body language; encourage others to express their opinions freely; use probing questions that uncover relevant issues.
- **Self-confidence.** Control and direct others; accept leadership roles in order to help the organization resolve pressing issues; obtain the trust and confidence of others.

This study also evaluated the unsuccessful quality professionals. In addition to missing the 16 behaviors noted here, this group was too directive. This relates to behaviors that direct the outcome of group choices, charge others to improve work efforts, or command action that individuals and teams must execute.

comes from identifiable causes. This means that the process has been mapped, measured, and characterized so that all activities and tasks are understood and the root causes of common-place process variation have been determined.

On the other hand, improvement activities are directed toward eliminating the "uncommon" sources of variation. Improvement occurs when the work measures are monitored regularly and opportunities are identified for shifting the process performance in a way that reduces variation or increases the stability of the process performance variables (quality, cost, or time).

Improvement projects that are within the ability and resources of the local process owners should be implemented without delay. Those improvement projects that require capital investment or the participation of cross-functional groups usually require more attention for implementation. The ability to implement this second type of project is a function of its return on investment and its relative priority when competing for scarce resources within the organization. Improvement represents the periodic assessment, identification, and implementation that overcomes chronic process degradation or sporadic degradation that occurs because of a special cause.

How are these subprocesses implemented in a real-world business environment? Strategic insight will be required of the next generation of quality professionals, who will be called upon to facilitate this planning process that transforms strategy into daily work objectives. This will require quality professionals to have detailed business knowledge and understanding of the direction of the company.

Step 2: Harnessing technology, acting proficiently

To manage a business well, it is important to have a variety of means to solve problems. Sporadic problems should be detected by the work group teams, and they should apply their problem-solving and process tools to resolve any defect-producing situations. Chronic problems should be addressed by the professionals in their areas of vocational competence.

The quality professional of the future should be able to harness technology to analyze complex business problems.

Because all employees will have mastered the basic analysis tools and functional professionals will have mastered advanced quality analysis tools that are related to their professions, quality professionals will need expertise to address the remaining problems.

Karou Ishikawa once said 80% of all problems can be solved with basic quality tools: those being used by all associates. Applying the Pareto principle, it seems reasonable to postulate that 80% of the remaining 20% of all problems can be solved by professionals using the advanced quality tools. This would leave only the last 4% of all problems—the truly tough ones—the expert problem solvers that remain in the quality profession.

In addition to this trend, a second trend influences the job content of future quality professionals. Today, in many large organizations, the responsibilities of quality professionals are being merged with human resource professionals (industrial psychology, training and development, employee relations, organizational development, and so on), industrial engineers (applying such tools as design for manufacturability, process capability analysis, statistical process control, and work process measurement), and information technology professionals (work process analysis, information management, and systems analysis). This trend is being driven by the overlapping charters given to these functional organizations for process improvement and building teamwork at the front line.

In addition, the expansion and integration of information technology has been a catalyst for the convergence of competence. It will be much easier to bring these functional areas together once the core elements of their traditional competence areas have been dispersed to frontline employees and once teams are self-facilitating and empowered to use real-time data for adaptive improvement of work processes, requiring only occasional support for obtaining nonroutine data or applying more sophisticated analysis tools.

Some competencies that are not traditionally covered in these professions, which will become more critical, include reliability engineering; process design; product and service design; anticipation of customer requirements, expectations, and factors that will cause customer delight; customer and employee survey design and administration; and management of quality system certifications and product approvals of government agencies, such as the Food and Drug Administration and Federal Communications Commission.

Step 3: Behaving with quality competence, acting empathetically

The quality professionals of the future must be able to act empathetically to relate to the people involved in all areas of the organization, from frontline workers to top-level managers. They must be able to adapt to the different conditions of work that occur at each organizational level and across the different styles and types of management that individuals exhibit. They must be flexible so they can influence individuals and teams to come to collaborative decisions, in addition to providing the technical support required for handling complex problems.

The sidebar “Behaviors Leading to Success” lists the results of a study by one company.

Step 4: Living locally, acting globally

The fourth area of expanded competence involves achieving and maintaining operational excellence in the knowledge world

by collaborating within and across organizations. Organizations will not only rely on their own people, but they also will need to build business alliances and partnerships that extend the capability of the firm. Internal competence in managerial, technical, and behavioral proficiencies will be increased by following the first three steps of this transformation process. This fourth step will increase the business’s ability to compete.

There are three areas where quality professionals will build their networking capability: internal networks within their organization, external networks within their profession, and external networks outside their profession.

Quality professionals will need to build internal and external networks of people who share related competence. ASQ’s divisions address this requirement by providing groups that are centers of excellence, such as statistics, reliability, and quality management, as well as communities of practice, such as automotive, education, food and drug, and chemical.

This makes it possible for quality professionals to learn how to apply technical concepts across a field of industries, as well as in specific industrial settings. As the future unfolds, the issues addressed will involve more strategic areas, such as competitive analysis and management analysis.

Step 5: Ubiquitous competence, acting expertly

The future is happening now, across many applications and geographies, but quality professionals have not embraced it and stepped forward to lead the charge. The availability of a wide variety of computational approaches (the electronic hammers) now takes the drudgery out of statistical analysis, making it possible for all employees to handle more complex problems. Quality professionals, however, still will be called upon to help with tool selection and application.

The reality that quality principles and tools can be applied in every organization and situation is apparent when the following anecdotes from the public sector and not-for-profit organizations, historically considered the most challenging environment, are considered.

- In Rochester, NY, a group of Black Muslim men, under the leadership of their Imam, Hanif Abdul Wahid, have partnered with the local community center and formed a group called the Rochesterians Against Illegal Narcotics (RAIN). They use quality methods to identify community problems, prioritize neighborhoods for action, form teams to work on economic improvements, and confront drug dealers with the fact that local residents will no longer stand by and let the drug dealers claim the 19th Ward as their own.
- In Houston, TX, Memorial Baptist Church has been using quality methods to improve management of its local ministry and outreach to its community.
- In Wisconsin, the Madison Area Quality Improvement Network has built an alliance of more than 170 members. This group identifies up-and-coming grass-roots leaders from housing projects, parent-teacher organizations, and other community groups and provides them with a year of mentoring and training in leadership skills with an emphasis on the application of quality improvement methods. Their theme is: “Everyone is a learner; everyone is a teacher; everyone is a leader.”
- In Tacoma, WA, city staff and community leaders have teamed with members of the Deming Institute to learn how to prevent systemic problems. Following a year of education for local business owners, concerned citizens, and city staff, as

well as members of other county, state, and federal agencies, a unified project to eliminate domestic violence is under way.

Quality professionals need to encourage this transition by providing suggestions, fully participating in the changes, and taking personal responsibility for bringing quality into our communities and all areas of our personal lives.

The quality professional faces a tough decision: to sit in an ivory tower on a hilltop and be the archetypical, iconoclastic guru who loses touch with the real world and watches the time pass, or to be a true active learner, who reflects on the past and present and reaches out to discover the pathways to the future.

Are we ready to take this journey? Think back to the technology transitions we have observed over our lifetimes. Many of us learned touch typing on electric typewriters; today's students are aided in their learning by high-powered Pentium microprocessors. Yesterday's textbook doesn't even fill a single CD-ROM.

We must face the future not with technophobia, but learning how to apply technology in appropriate ways to help ease the problems we face as people involved in ever more complex work processes.

The pace of technology has accelerated over the last 50 years at a blinding rate. Inevitably, quality professionals also must change or be left on the sidelines. Change, however, should fit well into the world of continuous improvement. Quality professionals accept the fact that work processes must change to improve. Will the necessity of personal changes in competencies and approaches be so widely accepted? The future will answer this question by showing whether today's quality professionals were prepared for their new role or were left by the wayside. How about the fact that we must change as people in order to improve? As Winston Churchill once remarked, "To improve is to change; to be perfect is to change often."

Reference

1. Futures Project report (Milwaukee, WI: American Society for Quality, 1996).

Acknowledgment

The author wishes to thank A.H. Jack West and Deborah Hopen for their review of this article and Thomas J. Mosgaller and Hopen for the examples they provided during this article's preparation.

Copyright 1998 by Business Systems Solutions, Inc.

Gregory H. Watson is managing partner of Business Systems Solutions, Inc. in Tampa, FL. He is an academician with the International Academy for Quality. Watson is a senior member of the American Society for Quality (ASQ) and the Society's vice president of research and technology. He was instrumental in developing ASQ's technology plan following his participation in the ASQ 1996 Futures Project.

What did you think about this article?

<i>Quality Progress</i> needs your feedback. On the postage-paid reader service card inserted toward the back of this magazine, please circle the number that corresponds with your opinion of the preceding article.	Excellent	Circle #309
	Good	Circle #310
	Fair	Circle #311
	Poor	Circle #312

Back to the Future

*'Foresight 2020' offers scenarios
for quality's next 20 years*

by

Gregory H. Watson, ASQ president-elect

A FUNNY THING HAPPENED ON THE WAY TO THE FUTURE: IT GOT HERE A lot faster than expected. During 1995-96, the Board of Directors sponsored ASQ's first futures study. It was a look forward to the year 2010 to analyze how potential changes would affect society as a whole as well as ASQ and its members. At the time, not everyone could see the value of the study, and some questioned whether an exercise in imagining the future would have much usefulness in the day-to-day application of quality. But two developments since that study have confirmed the value of futuring.

First, ASQ took the results of that study, *Quality, the Future and You*, and used them in making several significant changes to prepare for the years to come. These included a constitutional convention that changed the Society's name and streamlined its operating guidelines, a technology strategy that led to a \$2 million systems upgrade, a research strategy designed to put ASQ at the forefront of developing new quality technologies and methods, and a new strategic plan focused on building global alliances and increasing the effectiveness of society operations.

The second development has been the arrival of projected changes far sooner than we anticipated. Some examples include the boom in the Internet and in cellular communications, as well as the rapid convergence of telecommunications and computer technologies. We've also seen significant shifts in the global marketplace, with a growing role for China, while Japan—long the mainstay of the Pacific Rim economy—has suffered a reversal of fortune.

Change on such a scale and at such a rate persuaded the board that it was appropriate to take another look at the future and conduct a new study. It is called *Foresight 2020* and was intended to expand our vision to two full decades into the future.

A team met in Milwaukee in the middle of August to sift through data about technological, economic and demographic growth; sort through observations from learned futurists and technologists; and consider the opinions and responses that were solicited from ASQ volunteers at the section, division and national levels. This team was facilitated by the Institute for Alternative Futures (IAF), which is the same not-for-profit organization that facilitated our first study.

Complete results of the *Foresight 2020* study are scheduled for release at the Annual Quality Congress in Indianapolis next May. Over the next few months *Quality Progress* will provide information about the study, starting this month with a look at the scenarios that were developed by the futures team.

Scenarios are a key tool in this futuring process. They describe how current trends may intersect and interact to create the economic and social conditions of the future. These scenarios are not intended to give us a single forecast of the future but rather a range of possibilities, which in turn can be used to test our thinking about current assumptions and paradigms.

IAF describes scenarios as “windows for learning” and suggests that they be used in a way that combines a broad consideration of the macroenvironment with focused attention on relevant aspects of the operating environment. Typically four scenarios of the future are developed: a best-guess extension of current trends, a worst-case look at hard times and two additional versions of a future, both of which are structurally different from the present.

We don’t expect that these scenarios will describe precisely how the future will unfold, but we can use them to stimulate our thinking about the role of the quality professional in the future. These scenarios help us see some important implications from our journey back to the future, such as:

- The pursuit of quality must change: becoming more innovative, flexible and faster at implementation of effective solutions that drive business results and reflect customer desires better than competitors do.
- Although the requirement for quality professionals may be diminished, the need for quality and statistical expertise will continue into the foreseeable future.
- Quality professionals cannot afford to be passive but must establish personal plans for development that help them to grow both a broader understanding of business and the required technical and statistical skills that will serve them in the next millennium.

- ASQ must evaluate the findings from this study and examine its structure, systems and style of operation to determine what it must do to prepare to serve its members.

Quality Progress is publishing excerpts from the scenarios that were developed by the ASQ Foresight 2020 Futures Team for two reasons. For the Society as a whole, these scenarios can help inform our thought process as we develop strategy and tactics. In addition, individual members can use these scenarios to explore how their personal lives and careers may be affected by the changes that the future will bring.

As IAF points out, there are no data sets to help us measure the future. But that doesn’t mean that we can’t make intelligent extrapolations to help us get ready. Take these scenarios and try them on for size. In thinking about how you may or may not fit into them, you may also see ways in which you can shape the probability of any particular projection of the future becoming a reality.

As a society, we can shape the potential future by forming a strategy that erects barriers where possible to those future states that are undesirable. We can also build strategic bridges to help facilitate those future states that we find attractive.

The Fruits of Knowledge

The Fruits of Knowledge represent the “official future,” extending today’s status quo—especially the rise of the knowledge economy—out to 2020. In this scenario, quality has been instrumental in realizing the benefits promised by the knowledge society. But many companies and countries have yet to “get the religion.”

Looking back over our collective shoulder to 2000, it’s easy to see that quality was quietly responsible for pointing society toward many of the benefits we enjoy today.

The incredible economic boom of the ‘90s never led to the crash many feared. Instead, as some pundits

guessed, information technology and the rise of a knowledge economy were rewriting the economic textbook.

FORESIGHT 2020

In 2005 a team of economists (now Nobel laureates) unveiled their ingenious application of quality principles to devising new theories appropriate to these realities. This in turn raised quality's profile and prompted many governments to adopt proactive "quality policies," spurring deep-seated sectoral reforms and more sustainable economic health. In 2012 the International Monetary Fund took a cue from these successes and began extending quality's benefits to poorer nations; many economists consider this milestone decisive in the Russian and Brazilian turnarounds.

Technology remains the chief driver of change. In 2013 e-commerce eclipsed global gross domestic product; quality helped by devising international protocols and standards to facilitate, regulate and safeguard transactions. Bandwidth is unlimited thanks to the bevy of broadband satellites ringing Earth.

Convergence (of information technologies) and consilience (of knowledge bases), which in 2000 were just beginning to lift many specialties to new heights of synergy, have borne rich fruit. In health care, for example, the human genome map has been combined with longitudinal data and holistic approaches to yield customized, prevention oriented care.

Machine knowledge exceeds human knowledge: more appliances than people are on-line, and some expert systems outperform human logic. Machine intelligence does not yet exceed human intelligence, but the addition of sensory capabilities, massive interconnection and uncertainty are expected to deliver the breakthroughs artificial intelligence has sought so long.

Thanks to quality, information technology has finally fulfilled its social promise. For five years we have subjected all-important decisions about whether and how to exploit new technologies to a rigorous set of criteria devised by quality experts. But too many nations still toil in the rear, unable to make the leap. Benchmarked processes are being instituted to attack the widening gap between information haves and have-nots.

Technology also has intensified social strife. It's brought myriad new voices to the table, with a consequent rise in "noise." And it has introduced thorny ethics questions: the gene splitting furor makes the 1990's abortion debate look like a kindergarten spat. Also troubling is the rise of a "global hermitage," that population of loners who relate only electronically, shunning the real world with all its bewilderingments.

Globalization has been a harsh mistress, sidelining most organizations that fail to apply quality. Leading organizations are learning organizations, and quality is seen as the best strategy for creating and sustaining

learning. Knowledge management (KM) is considered an essential subset of quality, systematizing the capture and just-in-time transforma-

tion of knowledge into bottom-line value. In turn, quality tools have helped overcome KM's early weaknesses, for example, creating measures and benchmarks for both knowledge processes and knowledge itself.

Mergers and alliances have completely revamped the business landscape. Today's companies are so modular they are more aptly termed "value chains." Each consists of a major brand-holder supported by thousands of niche partners and microenterprises. Competition in most industries is among three or four such value chains.

In the global agora, quality has been a priceless aid for providing customized experiences (every product and service is now couched as an "experience") to history's most demanding consumer base. Aging baby boomers, today's largest and wealthiest demographic, consider basic quality a given. They expect sellers to provide "systematic delight" geared to their personal values, tastes and goals. Thus, service is the prime source of competitive differentiation; it must be personal, information-rich and up to the minute.

Much production is actually in lots of one; other products are released in beta and then customized for or by their purchasers. To accomplish this, supply chain management has become a strategic function. Thanks to quality, the supplier-consumer partnership is mostly mutually respectful, profitable and enlightening (aside from a stubborn stratum of quality have-nots who eschew quality but scrape by in some small niche).

Yet this is only part of today's corporate agenda. Companies exist in a fishbowl, with consumer groups and word of mouth instantly broadcasting their every move. They must be exemplary citizens and environmental stewards. Quality has been used to develop social responsibility measures.

Workers fall into two categories: those who are free to work where they like and those whose jobs chain them to a single location. In either case, loyalty between workers and their employers is nearly nil.

Quality professionals are fewer in number but higher in status. Scholarly practitioners are university presidents or deans. In business they are change leaders and knowledge managers who operate at the strategic level. The Global Society for Performance Excellence (formerly ASQ) is at the crest of this wave, helping professionals and nonprofessionals carry quality's message throughout society.

SCENARIO
2

Back to the Past

Back to the Past visits a world in which economic and environmental disruptions, ineffective leadership and social fragmentation have created a vicious circle. Quality has spiraled downward, due partly to institutional cost cutting, partly to disenchantment with its outcomes and partly to the profession's own failure to grasp the seriousness of the situation and respond proactively. The profession has dwindled to near extinction.

Another recession is upon us, the fourth in 20 years. While we can count our blessings that it is not a depression, nonetheless we at *Quality Progress* must convey sad news: Along with the rest of ASQ, we cannot survive this downturn. We must close our doors.

In the spirit of quality, what lessons can we draw from this (perhaps temporary) turn of events? Could the quality profession have tilted the game toward a different outcome?

Today's unwelcome situation originated in the stock market crash of 2003. The high tech bubble finally collapsed, sapped by persistent recessions in Japan, Indonesia and Brazil; Alan Greenspan's untimely death in office was the final straw. From there everything went downhill. Millions of middle-class investors found themselves bankrupt—and unemployed. As major firms lopped heads, small businesses were left without markets and entrepreneurship wilted.

The inequities between small numbers of wealthy and increasingly large and desperate masses triggered breakdowns in cooperation and communication across all social facets. Citizens who could afford it retreated into walled compounds. The number of armed households rose to 75%. In developing nations, economic hardship blew the lid off a brewing backlash against globalization. Tribalist and nationalist protests swelled, destabilizing pro-Western governments. The Sri Lankan conflict drags on; war between China and Taiwan could pull in the West.

The Internet, helpless against organized terror, has

become a playground for hackers and hate groups and a vibrant black market in personal and national security data. Gangs have adopted quality principles, making their escapades terrifyingly effective. Most individuals and, increasingly, most utilities have moved "off-matrix." Embittered, millions of citizens have marched to "take back the Net!" A coalition of governments has declared war against the information pirates.

Technology research and development (R&D) itself has spun out of control, with labs and companies ignoring ethical and quality concerns in their pursuit of quick profit. Their laxity has allowed lethal microbes to fall into the hands of terrorists.

While quality professionals could not have averted all these trends, they could have injected a critical note of sanity—encouraging government oversight of technology commercialization and reviving the conversation about sustainability. Quality could have framed the crime debate on crime's root causes and their elimination. More broadly, is there any way the profession could have ensured quality would permeate the knowledge economy? The debilitating cycle of recessions has been prolonged in part by the failure to apply quality to financial institutions.

Speaking of sustainability, ecological disasters have been piling up like the cars in last week's 320-vehicle collision outside Berlin (after brakes failed simultaneously on four trucks). In the United States, funding cuts forced the Environmental Protection Agency to curtail enforcement; thousands of companies began ignoring the regulations (which since 2002 have been based on quality principles).

Globalization has contracted along with everything else. Alliances among nations, customers and suppliers have begun to break down. In global companies, knowledge management and porous organizational structures have largely reverted to knowledge hoarding, organizational pyramids and functional silos. Knowledge bases have been dispersed by massive layoffs. Overall, business has regressed from a quality stance, which had been starting to take hold universally, to a dog-eat-dog model in which the most cutthroat tactics win.

Forced to cut corners, by 2015 most organizations had frozen quality efforts wherever they stood. Many were disenchanting with quality in any case, since a study in 2011 showed no link between ISO 9000 and ISO 14000 certification and stockholder return. ISO standards are no longer supported by most companies. Customers themselves seek the cheap rather than the good.

Governments have become increasingly bureaucratized and hard to do business with due to their paranoia about technology theft and information

security. Reaching national, much less international, consensus on public problems is a challenge. Depression and the breakdown of meaning are the world's most pressing health concerns. Millions spend their waking hours immersed in virtual-reality games and theme parks.

Unsurprisingly, quality in every sector has slid drastically. Although centers of excellence remain, they are islands in a sea of mediocrity. At worst, quality is being fingered for not forestalling the disastrous conditions of our time.

For now, adieu. The haunting questions are left to our readers: Could quality have saved itself? Could it have helped avert economic and social meltdown?

SCENARIO 3

The Sustainability Show

The Sustainability Show finds a paradigm shift in progress: Sustainability is the central organizing principle for society. Quality is recognized as the best tool kit for achieving sustainability, and its principles, techniques and tools are ubiquitous. However, much of this progress has been achieved at the price of stronger, larger government. There is a foreboding rise in paternalism and authoritarianism.

Two decades of worldwide turbulence have pushed global society to a sustainability paradigm. Starting in 2001 all the bad habits of the Industrial Age seemed to bear rotten fruit at once. Years of rolling environmental crises, economic meltdowns, social violence and international terrorism finally led shell-shocked citizens to turn en masse to governments, pleading for an end to the anarchy and environmental destruction.

The United Nations effectively became our world government, with executive and legislative branches. National governments, too, are stronger. Public order has tightened, crime has declined, and social networks have strengthened. Faith in the group and authority have revived. And there is a strong consen-

sus for sustainability—an end to the folly of fouling our planetary nest.

However, we have also seen worrying declines in civil liberties and freedom of information. For example, the era of unfettered Internet commerce is over: taxes, access charges and cyberporn censorship have won the day. Perhaps these are just side effects of the pendulum swing toward centralization. But China's rise as a superpower has been influential, too. Since abolishing communism, China has displayed a pragmatic, cooperative face and lingering communist/Confucian paternalism. This style is spreading to non-Asian nations, including the United States.

Demographics will likely reinforce these trends. Baby boomers are starting to exit the world stage, along with their individualistic and idealistic legacy; on their heels, Generation-Xers are bringing a shrewd realism and a preoccupation with civic order to the public realm. And Generation-Yers, now in their 20s and 30s, are vigorous advocates of teamwork, rationalism and institution building; their influence will grow as they mature. So far, the effects are largely positive. Quality is recognized as the ideal set of tactical principles for executing sustainability. The Global Quality Council plays a key role in resolving world issues.

Many governments have diligently applied quality internally, becoming more globally oriented, agile, customer focused and technologically capable. An entire body of theory is emerging around the application of quality to governance in a knowledge based society. Governments' championship of private sector quality is equally keen: In the United States and European Union, public companies include quality in their shareholder reports, and last year the United States anointed its first secretary of quality.

Quality's mandate has expanded to include quality of life in the broad context of community and environment. In health care, to take just one example, this focus has fed into both lifestyle transformation (life expectancies of 95 are common in the advanced nations) and ecological restoration. In organizations, Six Sigma has become standard practice in all sectors.

Environmental sustainability became a regulatory mandate in 2019, backed by the Clean Earth Policy established at the 4th U.N. Conference on the Environment and Development. The policy is enforced by national and international regimes, but consumers, too, overwhelmingly vote with their pocketbooks if a company is deemed noncompliant.

The technological tide is turning away from R&D for profit's sake toward "appropriate" technologies that support social and environmental wellness. Quality also was applied to redefining the system of national

accounts. Now a nation's wealth is not limited to gross national product, but includes natural resources and social health.

Capitalism now aims for "good growth." Free markets are guided by win-win principles, enforced by rules and regulations. The stock market is being completely revalued around long-termism and appropriate technology. Some audacious young people sell stock in themselves, betting on their own future success. EarthDollars, a universal currency devised by quality professionals and administered by the new Global Treasury, have eliminated currency trading while still allowing local markets to set value.

Global society is mobile society. Loosening of national work permit restrictions has created a near global talent pool—and incited many governments to focus quality tools and techniques on creating attractive work/live communities. Employment is managed centrally through the Internet (in the process creating a global database of individuals' characteristics as well as their whereabouts—a development some view as dangerously Big Brotherish). All knowledge workers require basic quality skills to compete.

Corporations and governments share an uneasy alliance. Government regulation is significant—but thanks to quality, regulations are directed mainly at ends, not means, allowing maximum local decision making. Companies that fully reshape themselves for sustainability become inherently agile and knowledge enabled.



As a society, we can shape the potential future by forming a strategy that erects barriers where possible to those future states that are undesirable. We can also build strategic bridges to help facilitate those future states that we find attractive.



The Garden of Quality

*In **The Garden of Quality** our world has turned upside down. Since the millennium we have progressed from allowing technology to drive business and business to drive society, to subsuming technology to human and biospheric well-being. Most large institutions—legal systems, national governments, financial markets, universities—are fraying, giving way to fluid, self-evolving, human-centered systems based on trust and mutual benefit. Quality is invisibly embedded in every sphere of activity. People work within affinal communities to pursue common goals for human betterment. The planet has become a global village.*

Ten thousand years of human history have led us at last from seeking utopia—no place—to a version of utopia—good place. We have much to learn, but it seems that the social and technical structures are finally in place to support universal human and planetary well-being.

Quality has been central to this transformation. In the early years of quality's rise in the 1950s, we focused on inspection because we lacked the ability to control materials and their production. This emphasis shifted to control of work processes and evolved into continuous improvement directed at satisfying customers. In the 1990s an enhanced focus on measurement and statistical methods drove us toward Six Sigma performance.

Finally—following a decade of social and environmental turbulence—in the 2010s we embraced quality into our entire lives, radically reshaping society at every level. Quality itself moved up the value-added chain from operations (doing things the right way) to strategy and vision (doing the right thing). Quality professionals now are called on to lead visioning, as well as conversations about aspirations and co-creation.

What led us to such wholehearted adoption of quality? Snowballing social and ecological crises led to a mass realization that we had to change—fast. So how does our world look today? Let's take a virtual cruise.

Environment. An intensive worldwide research effort, roughly 100 times the scale of the Human Genome Project and supported by DNA supercomputers and satellite networks, seeks to fully map the intricate interactions of

Earth's biosphere and atmosphere. This will allow us to intelligently apply quality to handling the ecological legacies of the 20th century.

Technology. Technology is almost invisible yet almost everywhere. It has enabled new levels of self-governance and mutual aid. All computing is either biological or optical; tangible technology products are relatively few. Universal access to the global network allows it to serve as a worldwide institutional memory, connecting generations and cultures with a shared sense of history and future. Artificial intelligence is integrated into almost all systems, providing errorless service and leaving humans free to pursue the next level of breakthrough thinking.

Organizations. Visions and values—both developed via quality techniques—guide the processes and identities of most organizations. Whereas the Information Age held, “We are interdependent and should cooperate,” organizations today feel, “We are one and choose to co-create.” Large organizations use quality measurement and reporting systems (the later generations of SA 9000, Natural Step, and ISO 14000 and above) to manage change. Quality is an inherent skill of all knowledge workers—and every worker is a knowledge worker. Leaders are selected (usually under protest) by merit, and their mandate includes helping their teammates learn, grow and have fun.

Everyone is to some degree a generalist. Work is satisfying, with strong emphasis on motivation and recognition; creativity is born of play, learning and passion. E-lancers from all over the world collaborate virtually to solve problems and advance social goals. A huge library of best practices is maintained on the network by the Global Society for Performance Excellence (formerly ASQ), among its many functions.

Individuals. Serene and secure within concentric circles of family, work team, community, bioregion, planet and cosmos, most individuals enjoy strong self-esteem and mutual trust and respect with their familiars. Self-actualization is seen as one of society's chief purposes, and the proper balance of freedom and responsibility is a source of constant experimentation.

Society. Society is more pluralistic than ever as it fragments peacefully along affinal lines. We seem to be moving toward unity with diversity. Most problems are solved at the local or regional level, but local leaders cooperate intensively over the Internet.

Government. Governing institutions are minimal and nimble, focused on common services, such as transportation and common problems, such as environmental restoration. Even so, they need to watch their step. Today's citizens are not likely to cut much slack to governments that lapse into dogmatism, inefficiency or getting too big for their britches.



FORESIGHT 2020

THE AMERICAN SOCIETY FOR QUALITY CONSIDERS THE FUTURE

MEMO TO THE FOLKS IN SILICON VALLEY: YOU WILL HAVE GOOD JOBS FOR 20 MORE YEARS. BY 2020, THOUGH, COMPUTER CHIPS WILL BE CHEAPER THAN BUBBLE GUM WRAPPERS, AND PCs WILL BE IN MUSEUMS.... SILICON VALLEY WILL BECOME THE RUST BELT OF THE NEW ECONOMY.

Michio Kaku, Henry Semat professor of
theoretical physics, City College of New York

In 1995-96, when the American Society for Quality (ASQ) sponsored its first futures study—an analysis of how potential changes would affect ASQ, its members, and society in 2010—some questioned whether an exercise in imagining the future would be useful in the day-to-day application of quality. But two developments since then have confirmed the value of futuring.

First, ASQ used the results of "Quality, the Future, and You" in making significant changes to prepare for the future. These included a constitutional convention that streamlined ASQ's operating guidelines, a \$2 million technology systems upgrade, adoption of a research strategy to develop new quality technologies and methods, and a new strategic plan focused on building global alliances and increasing the effectiveness of ASQ's operations.

Second, changes projected by the original futures study happened sooner than anticipated. These include the boom in the Internet and cellular communications, and the rapid convergence of telecommunication and computer technologies, as well as significant shifts in the global marketplace, with China on the ascent and Japan in relative decline.

That scale and rate of change persuaded ASQ's board to conduct a new futures study. "Foresight 2020" is intended to expand our vision two decades into the future.

THE PROCESS

ASQ's 1999 futures team sifted through technological, economic, and demographic growth data; considered observations from futurists and technologists; and weighed opinions and responses solicited from ASQ volunteers prior to their three-day work session. On the basis of their work prior to and during the session, the team identified what they believed to be the key forces shaping quality as we move into the 21st century.

The team used these key forces to develop four scenarios for the future. Scenarios are a key tool in the futuring process. They describe how current trends may intersect and interact to create the economic and social conditions of the future. Scenarios aren't intended to provide a single forecast of the future. Rather, they illustrate a range of possibilities that can, in turn, be used to test our thinking about current assumptions and paradigms. Scenarios have been described as "windows for learning." They can be used to combine a broad consideration of the macroenvironment with focused attention on relevant aspects of the operating environment.

Typically, four scenarios are developed: a best-guess extension of current trends, a worst-case look at hard times, and two versions of the future structurally different from the present. This is the path ASQ's team took. From there, they considered which scenario was most likely to transpire, and then considered its implications for ASQ, its members, and society.

KEY FORCES FOR THE FUTURE

What are the key forces shaping quality as we head toward 2020? ASQ's 1999 futures team identified many important drivers. These are the eight key forces they identified as likely to have the greatest impact:

Partnering: Superior products and services will be delivered through partnering in all forms, including partnerships with competitors.

Learning systems: Education systems for improved transfer of knowledge and skills will better equip individuals and organizations to compete.

Adaptability and speed of change: Adaptability and flexibility will be essential to compete and keep pace with the increasing velocity of change.

Environmental sustainability: Environmental sustainability and accountability will be required to prevent the collapse of the global ecosystem.

Globalization: Globalization will continue to shape the economic and social environment.

Knowledge focus: Knowledge will be the prime factor in competition and the creation of wealth.

Customization and differentiation: Customization (lot size of one) and differentiation (quality of experience) will determine superior products and services.

Shifting demographics: Shifting demographics (age and ethnicity) will continue to change societal values.

SCENARIOS

While we can't say with certainty what the future holds, that doesn't mean we can't make intelligent extrapolations to help us prepare. Think about how you may or may not fit into the four scenarios developed by ASQ's futures team. You may see ways in which you can shape the likelihood of a given scenario becoming reality.

The scenarios are written from the imagined perspective of the editors of ASQ's *Quality Progress* magazine in 2020, as they reflect on what has transpired in the past 20 years relative to the quality profession. The four accounts follow.

SCENARIO 1: THE FRUITS OF KNOWLEDGE

The Fruits of Knowledge extends today's status quo—especially the rise of the knowledge economy—to 2020. In this scenario, the fundamental elements of quality management have been instrumental in realizing the benefits promised by the knowledge society. But many companies and countries have yet to “get religion.”

In hindsight, it's easy to see the quality movement of late 20th century moved us toward many of the benefits we enjoy today. In 2005, quality professionals devised new theories appropriate to the developing knowledge economy. This raised the profile of quality in business and prompted governments to adopt proactive quality policies, which in turn spurred reforms and enhanced economic health in the business sector. Following this lead, the International Monetary Fund in 2012 proactively extended the benefits of quality to less-developed nations, a decisive milestone in the Russian and Brazilian economic turnarounds.

Technology still drives change. E-commerce has dominated global business since 2009, and quality professionals played an important role, devising international standards to facilitate, regulate, and safeguard transactions. Telecommunication bandwidth is unlimited. The convergence of information and telecommunication technologies and the consolidation of knowledge bases have borne fruit. In health care, for example, the human genome map is combined with longitudinal data and holistic approaches to yield individualized, prevention-oriented care.

Machine knowledge exceeds human knowledge and some systems outperform human logic. Machine intelligence doesn't yet exceed that of humans but will soon deliver anticipated breakthroughs.

Since 2015, we've based strategic decisions about the development and exploitation of technology on rigorous criteria devised by quality experts. As a result, technology has raised living standards, empowered people with new communication tools and wealth, and spurred struggling nations toward self-sufficiency. But too many countries are unable to attain prosperity because they haven't accepted quality's wisdom. Benchmarking is helping bridge the widening gap between information haves and have-nots.

The intensification of social strife is the downside. Technology has brought new voices to the table, broadened issues of debate, and raised thorny ethical questions, such as the gene-splitting furor. A population of loners who shun the real world and relate only electronically has arisen. Individualism is pervasive, crime is up, and trust is low. Quality methods have been of some help, for example, in improving security through a process-oriented approach used to police the Internet for illicit material, information misdeeds, and global racketeering.

Globalization has sidelined organizations that don't embrace internationally-accepted quality principles. Learning organizations are leaders, and quality management provides the best practices for creating and sustaining learning. Knowledge management is an essential subset of quality, systematizing information capture and permitting the just-in-time

transformation of knowledge to bottom-line value. Sophisticated software helps manage the capture, processing, use, and storage of explicit and tacit knowledge—freeing humans to focus on higher-end analysis and applications.

Mergers and alliances have revamped business. Companies are complete value chains of interlocking collaborative alliances, with three or four such competitors in most industries. Information is shared seamlessly and instantly via integrated demand-and-supply networks. Strategic planning, human resources, and finance are often conducted jointly to facilitate global distribution with local customization.

Every product and service is now couched as an “experience.” Quality’s priceless contribution has been to focus business on providing customized “experiences” to history’s most demanding consumer base. Quality’s a fundamental requirement for baby boomers and they expect sellers to provide systematic delight geared to their personal values, tastes, and goals.

Competitive differentiation centers on personal, information-rich, and up-to-the-minute service. To coordinate this high degree of customization, supply-chain management has become a strategic function. Successful organizations have seamless end-to-end distribution systems with consumer demand visible from all points. Customers double as a cost-effective research and development pool. Quality’s focus on customers has led to mutually respectful, profitable,

and enlightening supplier-consumer partnerships (aside from a few who eschew quality but scrape by).

Organizations must be exemplary corporate citizens and environmental stewards, as their every move is monitored and broadcast by consumer groups. Top managements coordinate their activities according to public opinion. Poor quality is recognized as a cost society must bear. Thus, quality’s emphasis on performance measurement has led to the development of social responsibility measures for all institutions.

While loyalty between workers and employers is nearly nonexistent, loyalty to teammates abounds. Many teams change employment together, leveraging their expertise into a powerful market position for collective bargaining.

Quality professionals are fewer in number but higher in status. They serve as university presidents or deans, or in business as change agents and knowledge managers who operate at the strategic level, designing and managing quality systems, training other managers, and monitoring performance at their own and competing organizations. Like intelligence analysts, they’re expert at seeking, evaluating, brokering, and exploiting knowledge to enhance their organizations’ performance. The American Society for Quality leads by helping quality professionals (and others) in personal development and providing a “knowledge hub” that allows them to translate quality’s core messages throughout society.

SCENARIO 2: BACK TO THE PAST

Back to the Past describes describes a vicious cycle of economic and environmental disruption, ineffective leadership, and social fragmentation. The quality profession has dwindled to near-extinction as a result of disenchantment with its outcomes, institutional cost reductions, and the profession’s failure to grasp the seriousness of the situation and respond proactively.

We must convey sad news: We cannot survive the current downturn and *Quality Progress*—with the American Society for Quality—must close its doors. What lessons can we draw from this turn of events? Could the profession have tilted the game toward a different outcome?

The current situation (the fourth recession in 11 years) originated in the 2009 stock market crash.

After years of sustained growth, the high-tech “bubble economy” collapsed, sapped by persistent recessions in Japan, Indonesia, and Brazil. Millions of investors were bankrupted—and left unemployed following massive layoffs, the demise of markets for small businesses, and the decline of entrepreneurialism. Inequities between the wealthy few and the desperate masses led to breakdowns in social

cooperation and communication. Millions have retreated to secure, walled compounds, and more than 75% of households are armed.

Economic hardship in developing nations unleashed a backlash against globalization and Western influence, including quality. Nationalist protests have swelled. The Balkan, Russian, African, and Arab-Israeli conflicts drag on, and the West may be drawn into the war between China and Taiwan.

The Internet is a playground for computer hackers, hate groups, and a black market in personal and national-security data. Gangs have adopted quality principles, making their terrorist tactics more efficient and effective. Embittered citizens march to "Take back the Net!" A coalition of governments has declared war on global information pirates.

Biotechnology research and development is out of control. Corporations ignore ethical and quality concerns in pursuit of profits. Lethal microbes have fallen into the hands of terrorists, episodes of germ and toxic warfare have occurred, and no community is safe.

Quality professionals could have encouraged governments to develop better processes for oversight and management of technology. They could have revived conversations about the sustainability of business methods and opened debates on how to measure quality of life. Quality methods could have been used to identify and eliminate the root causes of criminal activity.

The quality community's absence in the development of the knowledge economy—coupled with resistance to change among a core of quality professionals—kept the profession out of the debates that framed the concepts of knowledge management. The profession lost its influence on society's economic efforts for the future. Ongoing recession has been prolonged, in part, by the failure to apply quality methods to financial institutions and other elements of the global economic infrastructure.

Ecological disasters have piled up. In the United States, after funding cuts forced the Environmental Protection Agency to curtail enforcement, companies began ignoring quality-based regulations. Nuclear waste contaminated water supplies because quality

standards for its storage weren't met. Ozone depletion has resumed as a result of careless disposal of chlorofluorocarbons. U.S. competitiveness has been crippled by environmental mishaps that disrupted the flow of raw materials to industry.

Alliances among nations, customers, and suppliers have broken down. Lack of knowledge management and porous structures in businesses have led to knowledge hoarding, organizational pyramids, and functional silos. Massive layoffs have jeopardized core competencies. Business has regressed from a quality focus to a dog-eat-dog model in which only the most ruthless win. Many decision-making positions are held by Generation-Xers whose capacity for pragmatic idealism is overwhelmed by scarcity-mindedness and self-preservation.

By 2010, most organizations had frozen their quality efforts. The disenchantment with quality was fed by a 2007 study showing no link between ISO 9000 and ISO 14000 registration and shareholder return. The late 20th century promise of Six Sigma faded as profit-hungry consultants lacking knowledge guided failures in implementation, reducing Six Sigma to just another program of the day. Adherence to international quality standards is no longer a business requirement. Customers seek the cheap rather than the good.

Governments are more bureaucratic and hard to deal with because of paranoia about national industrial policy, economic growth, theft of technology, job protection, and information security. Reaching national or international consensus on any public issue is a challenge.

Depression is the world's most pressing health concern. Average life expectancy in the United States fell for the first time last year. Around the globe, social safety nets have ruptured, leaving millions of people facing poverty and illness.

Not surprisingly, quality performance has declined drastically in every sector. The few remaining centers of excellence are islands in a sea of mediocrity. Quality is blamed for not forestalling the disastrous conditions of our time. Could quality have helped avert the current economic and social meltdown? Could quality have saved itself?

SCENARIO 3: THE SUSTAINABILITY SHOW

The Sustainability Show tracks a continuing paradigm: Sustainability is the central organizing principle for society. Quality is recognized as the best approach for achieving sustainability, and quality philosophies, techniques, and tools have become ubiquitous. However, much of this progress has been achieved at the price of stronger, larger government. There is a foreboding rise in paternalism and authoritarianism.

Two decades of worldwide turbulence have pushed society to a sustainability paradigm. Environmental crises, economic meltdowns, social violence, and international terrorism have led shell-shocked citizens to turn to government for an end to anarchy and environmental destruction.

The United Nations effectively functions as our world government. In addition, national governments have become stronger. Public order has tightened, crime has declined, and social networks have strengthened. Faith in authority has revived. And there's a strong consensus for an end to the folly of fouling our planet.

Civil liberties and freedom of information have been curtailed. Unfettered e-commerce is over, as taxes, access charges, and censorship have won the day—natural effects of the swing toward centralization. China's emergence as a superpower has also been influential. Since abolishing communism, the Chinese have been pragmatic and cooperative but with lingering paternalism. This style is spreading to non-Asian nations, including the United States.

Demographics are likely to reinforce these trends. As baby boomers depart the world along with their individualistic and idealistic legacy, Generation-Xers are introducing shrewd realism and a preoccupation with civic order. Generation-Yers are strong advocates of teamwork, rationalism, and institution-building, and their influence will grow.

Quality principles are seen as the key to sustainability. The Global Quality Council mediates world business disputes. Governments have used quality to become more globally oriented, customer-focused, agile, and technologically capable. And government championship of private-sector quality is keen: In the United States and Europe, companies include quality in their shareholder reports, and last year the United States named its first secretary of quality.

Quality's mandate includes the quality of life. This has led to lifestyle transformation and ecological restoration. Six Sigma is standard practice in organizations in all sectors. Basic quality functions are fully automated; a new generation of tools incorporates control theory, adaptive learning, and artificial intelligence. Businesses achieve excellence through total enterprise integration based on universal connectivity and knowledge management. Quality professionals are moving into executive roles.

In 2019, environmental sustainability became a regulatory mandate, backed by the Clean Earth Policy established at the 4th United Nations Conference on the Environment and Development. The policy is enforced nationally and internationally, and consumers vote with their wallets if a company is non-compliant. Companies must adhere to ISO 14000, factor natural resource depletion into every product's cost structure, and achieve zero waste by 2030. Quality principles and methods have been invaluable in redesigning businesses for sustainability.

The technological tide is turning from profit-driven research and development toward technologies that support social and environmental wellness. Ripple effects have enabled poor countries to bypass the wired infrastructure of the Industrial Age for the wireless networks of the Knowledge Age. Quality methodologies are used to scrutinize technological innovations for their potential long-term effects.

Quality professionals helped redefine the system of national accounts. A country's wealth isn't limited to gross domestic product, but includes social health, natural resources, and the quality of infrastructure investments in intangibles (such as education) and tangible property. Government-sponsored research and development has produced amazing biological remedies, like mass farming of ocean algae to restore the ozone layer. Cellulose-based ethanol distilled from plants has replaced petroleum fuels.

Benign methods of weather control have eliminated the destructive effects of natural disasters. World population is stable at 8 billion, as women have attained political influence, education, and employment in most societies.

Capitalism aims for "good growth." Free markets are guided by win-win principles, enforced by rules and regulations. The stock market is being revalued to reflect the importance of long-term investment in sustained profitability. EarthDollars—currency devised by a quality circle of economists and administered by the new Global Treasury—have eliminated currency trading while allowing local markets to set value.

Looser restrictions on national work permits have created a near-global talent pool and induced governments to focus quality tools and techniques on creating attractive work-and-live communities. Knowledge workers must possess basic quality skills to qualify for study in a specific academic discipline.

Government regulation is significant but, thanks to quality, it's directed mainly at ends, not means, and

allows local decision-making. Companies reshape themselves for sustainability by becoming agile in the market, knowledge-enabled for routine management processes, and operationally excellent.

Since 2009, mass customization has been the rule for information products. Many goods self-adapt to changing user needs by intelligently monitoring use patterns. Distinctions between product and service are blurred in a customer-centered experience.

Institutional oversight is increasing. Transnational corporations pay global income taxes to the United Nations. A second round of international harmonization followed the bitter standards wars of 2009-11. Adherence to the new standards is a condition of free-market participation. This has hampered small businesses that are unable to simultaneously deal with bureaucracy and develop innovative products.

The social mood is also increasingly conformist. The \$64 billion question is whether social mores and government authoritarianism will impinge on corporate efficiency and profits—and on human freedom.

SCENARIO 4: THE GARDEN OF QUALITY

In the Garden of Quality, our world has turned upside down. We've progressed from allowing technology to drive business and business to drive society, to subsuming technology to human and biospheric well-being. Most large institutions are fraying, giving way to fluid, evolving, human-centered systems based on trust and mutual benefit. Quality is embedded in every sphere of activity. People work within affined communities to pursue common goals for human betterment. The planet is a global village!

Ten thousand years of history have led us from seeking Sir Thomas More's "utopia"—a non-existent ideal political and social world—to a new "eutopia," where the standard is not ideal but good. The social and technical structures are in place to support human and planetary security as a foundation for world peace and democracy.

Quality was central to the transformation. In the 2010s, we accepted quality as a guiding principle and radically reshaped society at all levels. Quality moved up the value chain from operations to strategy and vision. Snowballing social and ecological crises made us realize we had to change—fast, prompting:

- A mandate to reorganize society around personal, social, and environmental well-being.
- Adoption of cooperation and collaboration as organizing principles.
- Integration of organizational learning and knowledge management within quality—leading to more agile, innovative, and responsive organizations.
- A desire to leverage technological convergence into social improvement.
- Consolidation of knowledge bases for a rich understanding of our world and humanity's possibilities.

Let's take a look at our world.

Environment. Researchers are using satellite networks and DNA supercomputers to map the interactions of Earth's biosphere and atmosphere. This will allow us to apply quality methods to counter the ecological legacies of the 20th century. Quality systems are being used to identify and eliminate the negative impacts of all human activity. We're becoming the planetary stewards we should have been in the past. Eventually, humans will occupy nonarable land and surrounding areas will be returned to their natural state or tended as organically cultured gardens.

Technology. Technology has enabled new levels of self-governance and mutual aid. The global network serves as a worldwide institutional memory, connecting generations and cultures with a shared sense of history and future. Artificial intelligence is integrated into most systems, providing error-free service and freeing humans to pursue breakthrough thinking.

Organizations. Visions and values developed using quality techniques guide the processes and identities of most organizations. Large organizations use quality measurement and reporting systems to manage change. Every worker is a knowledge worker and quality is an inherent skill. Leaders are selected by merit and their mandate includes helping teammates learn, grow, and have fun.

Creating products and services that contribute to human betterment has replaced consumption as an

economic engine. Everyone's something of a generalist. E-lancers from all over the world collaborate virtually to solve problems and advance social goals. The American Society for Quality maintains a huge library of best practices on the global quality network.

Individuals. Secure in concentric circles of family, work team, community, bioregion, planet, and cosmos, most people have strong self-esteem and enjoy relationships of mutual trust and respect. Self-actualization is one of society's chief purposes. Learning is the preferred path to growth. Children are treasured, as are elders and their wisdom. Illness is nearly extinct, thanks to prevention-oriented lifestyles and genetically based customized medicine.

Society. Society is more pluralistic than ever as it fragments peacefully along lines of affinity. Most problems are solved at the local or regional level, and local leaders cooperate intensively via the Internet. Military services have been replaced by teams of problem-solvers who go where needed to resolve conflicts between organizations. People freely explore other communities and seek situations that suit them best. Quality is used to facilitate understanding of personal life choices.

Government. Governing institutions are few and nimble, focused on common problems and services. Even so, they must beware: Today's citizens won't cut much slack for governments that lapse into dogmatism, inefficiency, or arrogance.

IMPLICATIONS

Which of the four scenarios is most likely to transpire? Which represents the preferred future reality for the quality profession? ASQ's futures team considered both likelihood and preference. It's no surprise the team's preference was The Garden of Quality (Scenario 4), in which quality has been the driving force in transforming the world. When it came to weighing likelihood, however, the team gravitated to Scenario 1, The Fruits of Knowledge, an extension of the status quo. Scenario 3, The Sustainability Show, with its paradigm shift, was a close runner-up.

Remember, none of the scenarios is intended to describe precisely how the future will unfold. But we can use all the scenarios to stimulate our thinking about the role of the quality professional in the future. The scenarios help us focus on important implications for the future. For example:

- The pursuit of quality must become more innovative, flexible, and faster to implement effective solutions that drive business results and reflect customer desires better than competitors.

- The need for quality and statistical expertise will continue in the foreseeable future, but fewer quality professionals may be needed.
- Quality professionals can't afford to be passive. They must establish personal development plans to help them to gain both a broader understanding of business and the necessary technical and statistical skills to will serve them in the next millennium.
- ASQ must evaluate the findings from this study and examine its structure, systems, and style of operation to determine what it must do to prepare it to serve its members.

These scenarios can help inform ASQ's thought process as it develops strategy and tactics. In addition, ASQ members (and others) can use these scenarios to explore how their personal lives and careers may be affected by changes the future will bring. On the basis of the scenarios, the futures team identified specific implications for the future for society at large, quality professionals, others who use quality tools and techniques, and ASQ.

IMPLICATIONS FOR SOCIETY

As the fabric of local communities comes under increasing strain, society will seek solutions. Organizations must provide opportunities for learning. Quality tools and techniques can be used to better society. We must think and act globally.

IMPLICATIONS FOR QUALITY PROFESSIONALS

A broad view of global business will be vital, and continuous learning, not just in quality, is important. Core quality tools and techniques must be adapted to diverse settings. The premium will be on strong communicators and collaborators. Advanced statistical tools and techniques will be an ongoing requirement.

IMPLICATIONS FOR NONQUALITY PROFESSIONALS

Quality tools and techniques should be available for use by all. Shared knowledge of quality will allow communities to operate at levels of excellence. Users of quality tools will benefit from training in cutting-edge techniques and research by quality professionals.

IMPLICATIONS FOR ASQ

The organization's structure, systems, and style of operation must be reevaluated. ASQ should seek more partnerships to create broader synergy and penetration of all components of society, and marketing must be expanded to include those outside the quality function. We must build greater awareness and respect for ASQ and quality, and become a global leader in target markets.

AMERICAN SOCIETY FOR QUALITY FUTURES TEAM

Futures Team Chair:

Gregory Watson, President-Elect, American Society for Quality

Also From the American Society for Quality:

Charles R. (Ron) Asbury, President

Steven P. Bailey, National Director

Christopher Bauman, Director of Finance and Society Services

Paul Borawski, Executive Director

Grace L. Duffy, Deputy Director, Region 11

Elizabeth M. Keim, Vice President

Ronald G. Kingen, Chair

Robert Krawisz, Director of New Business Development

Brian LeHouillier, Director of Programs and Operations

Miles Maguire, Editor, *Quality Progress*

Thomas Mosgaller, Vice President

Richard Sandretti, Director of Market Research and Public Relations

Sheila Zelenski, Director of Membership

Others:

Gary D. Floss, Medtronic, Inc.

Mary Lou Kotecki, John Deere Health Care

Marty Lustig, Sprint

Carla O'Dell, International Benchmarking Clearinghouse

Shannon Roberts, National Aeronautics and Space Administration

Facilitators:

Clem Bezold, Institute for Alternative Futures

Atul Dighe, Institute for Alternative Futures

Lenny Lind, CoVisions

JOURNAL

Of
INNOVATIVE MANAGEMENT

A Journal Reprint
Volume 6 Number 1
Fall 2000

FORESIGHT 2020: THE FUTURE OF QUALITY IN THE AGE OF TECHNOLOGY

Gregory H. Watson, President, American Society for Quality, Milwaukee, Wisconsin
Perspective



Journal of Innovative Management

Description

The *Journal of Innovative Management* is a peer-reviewed quarterly journal for experienced practitioners of quality management and continuous improvement systems. The purpose is to facilitate increased learning and innovation by providing people with cross-discipline information about organization transformation through participative planning, problem solving, and innovation. It is written to help leaders, managers, and workers to:

- ❖ Cope with the growing need to integrate quality management, systems applications, and creativity and innovation into their organization dynamics
- ❖ Integrate academic thought with real-world applications
- ❖ Cope with learning-time pressures by using an article format that enables faster reading and improved initial learning
- ❖ Facilitate a sense of community as readers see how people from various organizational settings and sectors face and solve what are essentially common leadership and managerial problems
- ❖ Achieve performance excellence throughout the organization.

The *Journal of Innovative Management* publishes articles that fall into the following matrix of categories:

- ❖ Cases, applied research, tools, news & views
- ❖ Organizational transformation, participative planning, problem solving, and innovation
- ❖ Private sector, public sector, and nonprofit organization settings
- ❖ Leading-edge and experience-based information, generally 1- 3 years old.

Reader Services

Reprints. Article reprints are available in hard copy, Acrobat™ PDF format, or as a next-day fax. Quantity discounts are available.

Ordering information. To order a subscription or reprints, call or write:

Customer Relations
GOAL/QPC
2 Manor Parkway
Salem, NH 03079

Phone: 800-643-4316 or 603-893-1944

Fax: 603-870-9122

E-mail: service@goalqpc.com

Web site: www.goalqpc.com

Name or address corrections. Send address or other changes to:

Journal Subscriptions
GOAL/QPC
2 Manor Parkway
Salem, NH 03079

E-mail: service@goalqpc.com

Permissions. Send requests for permission to quote passages from this article to:

Permissions
GOAL/QPC
2 Manor Parkway
Salem, NH 03079

E-mail: lsmith@goalqpc.com

Members of GOAL/QPC receive a subscription to the *Journal of Innovative Management* as a benefit of annual membership. To learn more about GOAL/QPC products, visit our web site at www.goalqpc.com.

The *Journal of Innovative Management* (ISSN: 1081-0714) is published quarterly by GOAL/QPC, 2 Manor Parkway, Salem, NH 03079.

Bob King, Publisher
Laurence R. Smith, Editor
Carolyn Field, Associate Editor
Daniel Picard, Assistant Editor
Cathy Kingery, Assistant Editor

Foresight 2020: The Future of Quality in the Age of Technology

Author

Gregory H. Watson, President, American Society for Quality, Milwaukee, Wisconsin

An uncertain future

There is confusion today about the future of the quality movement. Business is changing its emphasis on quality, and ownership of quality practices is also changing. Business professionals, not just quality professionals, are now using the quality tools. Many people also believe that there is a difference between Six Sigma and the quality principles. As leaders of the American Society for Quality (ASQ), we've had to ask ourselves: "What is the status of ASQ and the quality movement?"

The first future study: 1995

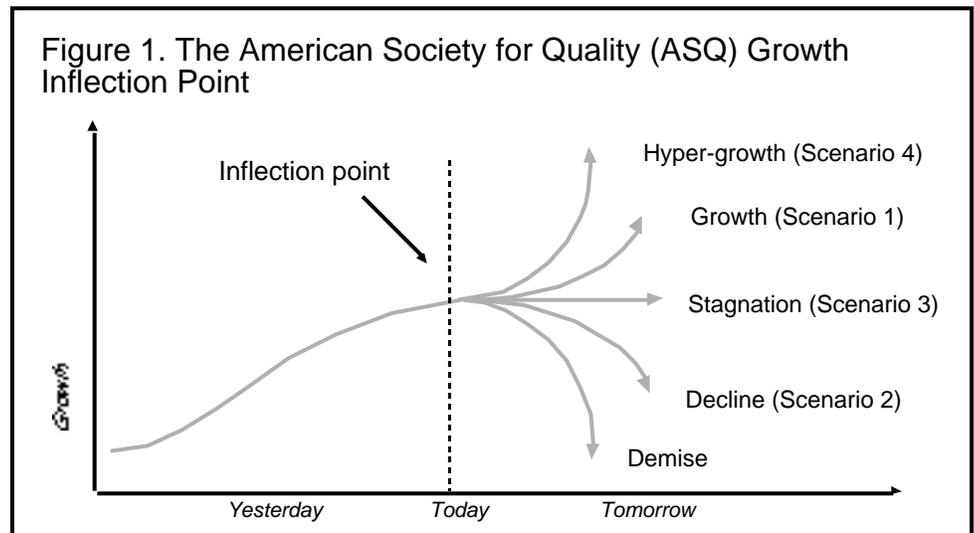
Back in 1995, ASQ conducted its first study in which we looked forward to the year 2010 and our place in it. But a funny thing happened in the meantime: the future arrived much faster than we expected. We had grossly underestimated the rapid advancements in technology, such as the Internet, and how much these changes would alter the business landscape. The technical forecasts we made were achieved almost five years ahead of our expectations. We also overestimated Japan's economic influence and underestimated China's. But the study did help us prepare for the years to come, and led us to initiate important strategic changes for the organization, including a \$2-million systems upgrade, a name change, a new organization structure, and a new research strategy. Those changes have served us well, but they are not enough. We realized that we have to look again at the forces that will shape our future, so that we can continue to play a vital role in it.

The Foresight 2020 study identifies critical assumptions

In August 1999 we convened a future study team, many of whom were also members of our strategic planning committee, to conduct Foresight 2020, a look ahead to that year. This study increased our understanding of our entire business environment, our customers, and ourselves. More importantly, the results of this study yielded insight into the critical assumptions we have about the quality movement and our society.

This study identified some key demographic, economic, cultural, and technical trends that will continue. We also identified eight forces that will shape our future, and from these trends and forces we created four possible scenarios. Our aim is then to develop recommendations for action plans for ourselves, our constituents, and our customers based on these scenarios. ASQ has reached an inflection point: the future growth of our organization can move in any number of directions (Figure 1 on the following page). In the '80s and early '90s interest in quality bloomed—and mem-

The Foresight 2020 study identifies critical assumptions, continued



bership in ASQ grew in proportion to this interest. Although in the last few years we've had some significant growth in a few niche products such as ISO 9000 and health care, we've experienced flattened growth overall—in membership, certification, conference attendance, and in sales of our other products.

Let's look more closely at the trends among these driving forces that we believe will continue to shape our world, and the critical assumptions we are making that will affect how we interpret our future opportunities.

Inputs for our scenario planning

(1) **Demographic forecasts.** There are two peaks in population caused by increases in immigration and birthrates: the so-called Baby Boom Generation and Generation-X. During the baby boom, birthrates increased in the 1940s, peaked in the late '50s, and then bottomed out in the '70s. The second increase, Generation-X, began in the late '70s, peaked in the early '90s, and is now tailing off. These two cycles indicate there is a 40-year pattern of growth—that fact allows us to anticipate the beginning of another new cycle in the year 2010.

We all have spending, saving, and investing habits that are a function of our age. Therefore around 2010, we can anticipate a slowing of spending as many of the Baby Boomers start to conserve their incomes and increase their savings in preparation for retirement. That money then becomes the investment capital needed to create innovation in our children's generation, the fruits of which will come to market sometime later when our children have established themselves in their careers, and we have retired.

We identified this *cycle time for innovation* as one of our critical assumptions: the time to market for new inventions will remain constant and cyclical.

(2) **Technological forecasts.** There are several technical areas that we believe will come into fruition by the year 2020. One is nanotechnology: the manipulation and manufacture of materials and devices at the molecular scale. Computer-aided customization will become routine, as we see in the Lexus automobile with its

Inputs for our scenario planning, continued

programmable seat control. Fuel cell technology will come into its own: automobiles (consider the technology linkage that has been established between Ballard Technologies, Ford, and DaimlerChrysler) and homes (look at the work of Plug Technologies) will be able to use alternative fuel sources. High definition TV will become commonplace, and be incorporated into our cellular phones, smart maps (these will interactively define the direction required based on feedback loops from geographic satellites that track your real-time movement), and handheld computers. People will carry an electronic wallet, a smart card really, that will replace the keys to your house, your driver's license, credit cards, medical records. A company in France called GemPlus has already begun marketing products. Many of these technologies have been around for some time, but we will now see integration of computing power and information access into new products and services.

We make a couple of critical assumptions regarding technology: first, is the *continuity of technological growth*. Moore's Law* will continue to hold true (or even accelerate). A second related critical assumption is: *the health of the economy and distribution of money will continue to be significant in determining the speed of commercialization* for new technology. In developed retail markets, the more people with discretionary funds to spend on new technology products (these are the early adopters), the faster a product, such as HDTV, can move to mass market, because their critical mass provides a rapid payback for the inventor's investment, allowing a more rapid price reduction. Another critical assumption is that *the existing investment in production capacity for a mass market creates its own inertia*, slowing down the investment and development of new technology. This explains part of the phenomenal growth of the Internet: it didn't have to displace another technology.

Critical to the shift in the technological force is that once we thought that it was only important to own the patents. Now the speed of technical diffusion, the time it takes for technology to be commercialized, is accelerating, as we become more sophisticated in turning intellectual knowledge into commercial applications. This means that the time to obsolete patents is becoming more rapid and their enduring value is less important, but their significance as "business trading cards" is becoming a more significant aspect of future business alliances and technological partnerships.

(3) **Social forecasts.** We made a number of social forecasts:

- **Electronic immigrants and telecommuters.** Electronic immigrants from other cultures and economic conditions will continue to displace workers in more favored economies. Many companies now hire computer programmers in India or Eastern Europe who then telecommute. The labor costs of these telecommuters are about 10% of a programmer in the U.S. or Western Europe. The flip side of this coin

*In 1965 Gordon Moore, co-founder of Intel Corporation, observed that the number of transistors on (and the power of) integrated circuits doubles roughly every 18 to 24 months, while the price remains relatively constant. This observation has become known as Moore's Law.

Inputs for our scenario planning, continued

is that telecommuting will have a positive impact on family life, as more people have more time available to spend building their personal relationships.

- **Virtual reality.** The virtual reality created by the Internet and computer games will have a growing negative impact as a new form of addiction. People will become addicted to this artificial world that they can control, becoming more physically and emotionally disconnected from their families and communities.
- **Information warfare.** Computer viruses, worms, and other forms of technical sabotage will become an increasing threat to computer and web-based organizations.
- **Lingua franca.** English, already the dominant language of business, aviation, and science, will become the dominant language of the web. Toshiba of Japan, declared in January of 2000 that English will be their corporate language.
- **Knowledge entrepreneurs.** We'll see the development of the "gold collar" worker; this is someone who sells his or her knowledge to the highest bidder to improve business performance. Author John Naisbitt, in his book *Megatrends*, said that information was becoming the most precious resource companies own.
- **Intelligent tutoring systems.** Schools will be transformed from classrooms into intelligent tutoring systems by the application of interactive media. This technology will adjust instruction to the needs and interests of each individual student to make learning more effective and fun. This innovation may reverse the current trend towards more teamwork and heterogeneous grouping in public schools.
- **Digital revolution.** The digital revolution will focus society on its value system: how it works together effectively and behaviors that facilitate efficient work both within and across organizational structures. Attention will be focused on trends that decentralize, globalize, harmonize, and empower work.
- **Values.** A return to "family values" will also occur, as the home becomes a center for both work and family.

What do we really know about the future?

We identified eight driving forces that will shape our future:

- (1) **Partnering.** Superior products and services will be delivered through partnerships, ranging from strategic alliances to mergers and acquisitions. Companies will become more adept at choosing the right partner to accelerate the application of knowledge—the fundamental reason for partnership.
- (2) **Learning systems.** The use of advanced technologies will speed knowledge transfer in education.
- (3) **Adaptability and flexibility.** The velocity of change is increasing in society; so adaptability, flexibility, and the ability to manage change are becoming increasingly important. We will have to discover simpler solutions to deal with the increasing complexities of an ever-changing environment.
- (4) **Environmental stability.** We will start to act on a truly global basis to stabilize and preserve the natural environment, as we realize that the actions of local groups are insufficient to preserve the ecosystem as a whole.

What do we really know about the future? continued

(5) **Globalization.** The shrinking globe will continue to shape our economic, political, and social environment. There will be continuing growth of trade unions, such as NAFTA and the European Union, as nations realize that they will have to band together to have the economic strength needed to compete. The electronic transfer of money across international borders obviates the local governments' role in taxation. A more global perspective is going to be required to prevent sub-optimization. Whether real or virtual, the battles of the future will be fought not over land borders, but over electronic ones.

(6) **Knowledge focus.** Knowledge will become the prime competitive and wealth creation factor. The Internet explosion has underscored the significance of an organization's knowledge and the value of intellectual assets as a commercial property. Peter Drucker and other management guru's have heralded the next business age as the "age of knowledge." Knowledge begets knowledge as each organization finds ways to grow its knowledge base and capitalize on its internal intellectual assets. As manufacturing grows less important and is pushed off-shore to "developing nations," the developed world finds more of its business emphasis placed upon service industries and knowledge creation industries (research and development). A critical assumption related to knowledge is that the manufacturing base of a country is the best indicator of its development. The future emphasis will shift toward service, and manufacturing will no longer be a valid indicator of wealth generation capability.

(7) **Customization and differentiation.** These will continue to grow in importance; as Tom Peters said, "We'll...be building in lot sizes of one for all customers." This level of product differentiation is going to become even more important to growing sales, so we'll have to find ways to deal with this potential dilemma by learning to both customize products and mass produce them at the same time so that we can operate most efficiently. Product specialization will be delivered in what we call the "soft side" of the product, rather than the "hard side." An example of this is what is called a software radio: all of the features are located in a microchip that can be programmed to perform any radio telecommunications function.

(8) **Shifting demographics.** The social values and ethnic makeup of our society will continue to change. This driving force will create a leveling effect across national boundaries as nations compete via e-commerce across national boundaries. The shift in values and ideals will span across generations and around the world (age groups are not normally distributed by country). Many times the transition between two generations results in a social riff that separates parent from child and leads to alienation of one or both parties. (I hope that this change will occur more smoothly than it did from my father's generation to mine.)

Scenario planning and option analysis

When we began to construct our scenarios, we realized that no amount of "futuring" would allow us to see the road ahead clearly. What matters though is that they are a helpful way to consider what *could* happen. We wanted to look at the second and third order implications of coming changes, so that we could build

Scenario planning and option analysis, continued

barriers to prevent any unwanted outcomes, and build bridges to allow desired outcomes to become true.

This study also led us to understand the importance of our critical assumptions. It is imperative that leaders understand the assumptions upon which their business rests. If they don't, no matter how good their strategic planning is, they won't know when those assumptions have been nullified until it is too late. Bayesian thinking and conditional logic need to be brought into use by senior management to prepare them to live and work adaptively in a chaotic world. There need to be explicit trigger points in business planning processes that cue managers when the future trends that they anticipate and have used as a basis for planning have been suspended and they need to seek alternative directions.

When the future unfolds into reality, scenarios are no longer important; the options that have been studied in the past provide clues to define boundary conditions for the set of future decisions. The choices of the future are determined by the deliberations in our past. Scenarios help us to think conditionally about future choices and ASQ used four scenarios to help think about what could become reality. These four potential realities provided a breadth of alternative futures that ASQ's strategic planning team considered to test how well its plans would fare under different conditions.

The Fruits of Knowledge (Scenario One)

The "base case" scenario

This is a "base case": the linear extrapolation from the status quo to the year 2020. The fundamental elements of quality management, (such as basic problem solving and the methods of total quality management) have been instrumental in realizing the benefits promised by the new knowledge society. Yet there are companies, countries, regions that have still "not got religion." The economic boom of the '90s never led to a crash as many feared; instead information technology and the rise of the new knowledge economy "rewrote economic textbooks." The quality principles were applied to these new realities to devise new theories by a new group of economists. The heightened awareness of the quality principles spurred many companies to deep-seated reforms and more sustainable economic health. Global organizations, such as the International Monetary Fund, took the cue and began requiring the adoption of the quality principles as a condition of economic assistance.

Technology remains the driver of change. In 2013 e-commerce eclipsed all other forms of commerce combined. The quality movement contributed to the runaway growth of e-commerce by helping to devise international protocols and standards that are used to facilitate, regulate, and safeguard commercial transactions.

Convergence of information technologies and the propagation, integration and cross-referencing of knowledge bases have lifted many vocational specialties to new heights of achievement. The human genome project, for example, has been combined with longitudinal data (cross-society trend analysis) and holistic approaches

The “base case” scenario, continued

(using both traditional and nontraditional medicine) to yield customized, prevention-oriented health care.

Information technology has finally fulfilled its social promise. Machine knowledge now exceeds human knowledge: more appliances than people are now on-line, and some expert systems outperform human logic.

Technology has intensified human strife, bringing many new voices to the table, and introduced many new thorny ethical questions, such as gene splitting. While these dialogs began during the early 1990s, they were engaged on the fringe of society. At this time however, these issues have moved into the mainstream and have become issues that divide political parties and create ethical and moral problems in large segments of society. More and more people have become loners, relating to the larger world only electronically as technology becomes a source of solace and alternate reality.

Globalization has sidelined many organizations; the remaining leading organizations are learning organizations. Knowledge management is considered an essential subset of quality, systematizing the capture and just-in-time transformation of knowledge into bottom-line value.

Mergers and alliances have completely transformed the business landscape. Today's companies are so modular that they are more aptly termed “value chains.” Each consists of a major brand-holder supported by thousands of niche partners and micro-enterprises. This organizational structure was created to maximize the intellectual property and contribution of the members of the “value partnership.”

Quality practices have enabled the production of “customized experiences” for history's most demanding customer base. Aging Baby Boomers, the day's largest and wealthiest demographic group, expect sellers to provide “systematic delight” geared towards their personal values, tastes, and goals. Much production is now done in lots of one; other products are released in beta and customized for their specific buyer.

Companies are now expected to be exemplary citizens of their communities; the quality principles have been used to develop social responsibility measures. Workers fall into two categories: those who are free to work where they like, and those that are tied to a location. In either case loyalty between the two is nearly nil. Quality professionals are fewer in number but higher in status. The Global Society for Performance Excellence (formerly ASQ) is at the crest of this wave, helping professionals and nonprofessionals carry quality's message throughout society.

Back to the Past (Scenario Two)

The world of 2020 is one where economic and environmental disruptions, ineffective leadership, and social fragmentation have created a vicious circle. The quality movement has diminished, due partly to institutional cost cutting, disenchantment with its outcomes, and the profession's own failure to grasp the seriousness of the situation. The profession has dwindled to near extinction; ASQ has closed its doors.

The quality movement dwindles with unhappy results

The quality movement dwindles with unhappy results, continued

This sorry outcome began back in the stock market crash of 2003, when the high tech bubble finally burst, sapped by persistent recessions in Japan, Indonesia, and Brazil. Many middle class investors found themselves bankrupt—and unemployed. The inequities between small numbers of wealthy and increasingly large and desperate masses triggered breakdowns in cooperation and communication across all social dimensions.

The Internet, defenseless against organized terror, has become a playground for hackers and hate groups, and a vibrant black market in personal and security data. Most individuals, and increasingly most utilities, have moved “off ’Net.” A coalition of governments has declared war against the information pirates, and people have rallied to “take back the ’Net.”

Technology research and development has spun out of control, with labs and companies ignoring ethical and quality standards in their pursuit of quick profit. Although quality professionals could not have averted all these trends, they could have injected a critical note of sanity. The quality movement could have framed the debate on crime’s root causes and their elimination. More broadly, they could have applied the quality principles to the new knowledge economy and financial institutions.

Ecological disasters have piled up like other disasters. Thousands of companies began ignoring EPA regulations since funding cuts forced the agency to curtail regulation.

The lid blew off a brewing backlash against globalization. Alliances among nations, customers, and suppliers have begun to break down. In global companies, knowledge management has been replaced by knowledge hoarding, organizational pyramids, and functional silos.

Forced to cut corners, most organizations have frozen quality efforts wherever they could. Most governments have become increasingly bureaucratic and hard to do business with. Not surprisingly, quality in every sector has slid drastically. Although centers of excellence remain, they are islands in a sea of mediocrity.

The Sustainability Show (Scenario Three)

This scenario shows a paradigm shift in progress: sustainability is the central organizing principle for society. Quality is recognized as the best tool kit for achieving sustainability, and its principles, tools, and techniques are ubiquitous. However, much of this progress has been achieved at the price of stronger, larger government. There is a foreboding rise in paternalism and authoritarianism.

Two decades of worldwide turbulence have pushed global society to a search for sustainability. At the turn of the century, all the bad habits of the Industrial Age seemed to bear rotten fruit at once. Years of rolling environmental crises, economic meltdowns, social violence, and economic terrorism finally led citizens to turn en masse to government.

The United Nations has effectively become our world government; national

Marshalling the quality movement

Marshalling the quality movement, continued

governments are stronger too. Public order is tighter, crime has declined, and social networks have strengthened.

Accompanying this has been a worrying decline in civil liberties and freedom of information. The wild west days of the Internet are over—taxes, access charges, and cyberporn censorship have won the day.

Baby Boomers have begun to exit the world stage; Generation-Xers are bringing a shrewd realism and a preoccupation with civic order to the public realm. Generation-Yers, now in their 20s and 30s, are vigorous advocates of teamwork, rationalism, and institution building. So far the effects are largely positive.

Many governments have applied quality internally, becoming more globally oriented, agile, customer focused, and technology capable. An entire body of knowledge is emerging around the application of the quality principles to governance in a knowledge-based society. In the U.S. and European Union, public companies include quality in their shareholder reports, and the U.S. appointed its first secretary of quality.

Quality's mandate has been extended to include quality of life in the broad context of community and the environment. In organizations, Six Sigma has become standard practice in all sectors.

The technical tide has turned away from R&D for profit's sake, towards "appropriate" technologies that support social and environmental wellness. Capitalism now aims for "good growth." Free markets are guided by win-win principles, enforced by rules and regulations. A universal currency devised by quality professionals, issued and administered by the new global treasury, has eliminated currency trading while still allowing local markets to set value. The electronic wallet, crypto-technology and Internet-based access accelerated this ability to shift to the universal currency.

Global society is mobile; employment is managed globally through the Internet, which some view as dangerously "big-brotherish." Corporations and governments share an uneasy alliance. Government regulation is significant, but it is addressed to the ends rather than the means. Companies that fully reshape themselves for sustainability become inherently agile and knowledge-enabled.

The Garden of Quality (Scenario Four)

In this scenario we have progressed from allowing technology and business to drive society, to subordinating technology to human and biospheric well-being. Quality has been the key to this transformation. The quality movement has shifted from inspection, to control of work processes, to a new focus on measurement and Six Sigma. The emphasis has moved up the value-added chain from operations (doing things the right way), to strategy and vision (doing the right things the right way). Quality has been embraced throughout our lives, radically reshaping society at every level by the use and application of the analytical tools and humanistic quality methods to integrate all of society's elements into a cohesive effort to better all

The quality movement fulfills its promise

The quality movement fulfills its promise, continued

aspects of goodness throughout the society.

The techniques of quality improvement have been applied solving the ecological legacies of the 20th century. Technology has been integrated into virtually every aspect of life, connecting generations and cultures. Values and vision statements guide the processes and identities of most organizations. Once organizations felt, “We are interdependent and should cooperate.” Now they feel, “We are one and should co-create.” Large organizations use quality measurements and reporting systems (later generations of SA 9000, Natural Step, and ISO 14000) to manage change. Knowledge of quality improvement tools is expected of all knowledge workers, and everyone is considered a knowledge worker.

Most individuals enjoy strong self-esteem and respect, and self-actualization is seen as one of society’s chief purposes. Society is more pluralistic than ever as it fragments peacefully along affiance lines. Government institutions are minimal and nimble, and are focused on common services. Governments have learned to watch their step, as today’s citizens aren’t tolerant of inefficiency, dogmatism, or high-handedness.

Continuing use of the quality tools is predicted

Of the four scenarios I’ve just described, the “Fruits of Knowledge,” an extrapolation of today’s status quo, was voted the most likely; while the “Garden of Quality” scenario was voted the most desirable. Common to all four scenarios was the recognized need for basic and advanced quality and statistical methods. What was uncommon was the degree of use and acceptance of the tools.

Implications for quality professionals

We looked at the implications of this study for quality professionals and for other users of quality improvement techniques. The pursuit of quality is changing, and must change. It has to become more innovative, flexible, and faster, while the requirement for quality professionals is diminishing. For example, out of 20,000 Six Sigma Black Belts trained since 1995, most are not quality professionals—they are people from line organizations. There is a projected 45,000 Black Belts to be trained over the next two years—again most will not be quality professionals. This represents a massive transfer of knowledge from inside the quality community to the world at large. The implication for quality professionals is that to stay viable we must become coaches for these new practitioners. Quality professionals will become a kind of process technologist who train others in the latest technology or cutting edge quality tools. This means we will have to become better educated, more collaborative coaches, able to work in situations where we don’t have authority.

Quality professionals will need to expand their levels of competency: we need to be able to explain the basic lessons of statistics to executives and the details of the design of experiments to an engineer. We must master the fundamentals and learn how to apply them in diverse applications. We must not only know what a flowchart is, but also how to relate a block diagram into a probability map, and how to teach an organization to do statistical modeling based on flowcharting principles. This requires more “bandwidth”—and lifelong learning.

Implications for society

The implications of this study for society are that as the population continues to grow, the strain of providing the increasing amounts of basic water, transportation, energy, and communication services will increase. We hope that the tools and methods of process management and quality improvement will be applied to solve these problems. All types of organizations will come to value continuing growth, and they will provide opportunities for continuing learning and challenges for all people.

Society will also have to learn to think systematically and act globally. Currently, I live in the Tampa Bay area where none of the three local communities of Clearwater, Tampa, and St. Petersburg plan or talk together. That is not a model for success in any area. Quality methods can play a role in helping organizations improve communication and manage by fact, enabling them to create better solutions.

Implications for organizations

There are several implications for organizations. Today we see that leading firms adopt the quality tools more readily than many other firms. Indeed, with Six Sigma, we can see documented proof that better bottom-line performance is delivered and documented through objective means. We see that the shared knowledge of quality is going to be the culture and operating language of companies, producing better business results and healthier communities.

Organizations are starting to think systematically, although different functional groups may refer to it by different names. In human resources it is called organizational development; in the information technology group, systems analysis; and in finance, internal auditing. But all of them use the same principles and tool sets. Over the last three years we've seen business processes—the support services in organizations—being subsumed under one individual called the Chief Administrative Officer.

We will see all business managers taking personal responsibility and being held accountable for quality, not just holding quality organizations as responsible. DuPont Corporation embraced Six Sigma 16 months ago; at that point they had four core values in their organization—none of which focused on measurement or accountability. Now personal accountability has been emphasized so that “the way people work together” is not just hiding decisions behind the veneer of a team, but each individual taking the personal responsibility for their actions and contributions to decisions.

A “unified theory” of the quality field

We know that we need to become customer sensitive and market-driven, responsive, agile, flexible, and adaptable, carrying with us a sense of urgency. In the past we declared that the quality community was our customer, but we didn't know what to do with that customer. Now we know we need to research them, ask them questions, figure out how to partner with them. We need to diversify our membership and our approach to quality. We need to be more relevant, significant, and accountable to our members. We need to stay at the leading edge of our profession.

A “unified theory” of the quality field, continued

Above all we have to realize that we have to be altruistic, public minded, and ethical in everything we do. If we succeed, we might achieve what eluded Dr. Einstein—a “unified field” theory. This unified field will have no more warring factions or leading gurus. We need to become a caring community, not a dysfunctional profession.

There is only one obstacle to our success, and Pogo said it best, “I met the enemy and they is us.” The reason for this is that too often people tend to hold onto their pasts more dearly than they should. We tend to build a collaborative fence around our profession’s status quo. The only way to change that is to become more inclusive and to become better listeners—that change will mold the future of ASQ and the quality movement.

Author information

Gregory H. Watson is president of the American Society for Quality (ASQ) for 2000-2001 (ASQ headquarters is located in Milwaukee, Wisconsin). He is also the managing partner and president of Business Systems Solutions, Inc., an Academician with the International Academy of Quality, and a Six Sigma certified Master Black Belt. Previously he served as vice president for quality at Xerox Corporation, corporate director of quality at Compaq, and manager of the Quality Leadership Development Program at Hewlett-Packard. Mr. Watson has served as a judge for the Texas and New York State Quality Award Programs, the Florida Sterling Award, and the Air Force Quality Award. He has been a member of the board of examiners for the Malcolm Baldrige National Quality Award, and a corporate representative to the GOAL/QPC Research Committee.

Editorial assistance was provided by Carolyn Field.

7 KEY FORCES



living
in the Future

3rd

Welcome to the third Futures Study report produced by the American Society for Quality (ASQ). Its intent is to project the landscape of the future so that we may position ourselves, both personally and as an organization, to succeed as we greet the unknown.

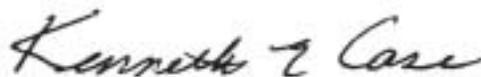
Our first Futures Study was conducted in 1996 to coincide with ASQ's 50th anniversary. The study identified potential changes that could occur within society and how they might impact ASQ and its members. As a result of this groundbreaking study, ASQ made significant adjustments to prepare for the years to come. A second Futures Study in 1999 also prompted ASQ to initiate a number of important changes. These are both summarized in this report.

In 2002, the ASQ board felt the time was right to conduct a third study in order to energize our strategic planning efforts. In the six years since the first study was

conducted, we have learned that the future arrives much faster than anyone can predict. Therefore, we are compelled to polish our crystal ball and remain alert to the signposts on the horizon. Only then will we be positioned to shift gears quickly to meet new challenges as they unfold. Any hope we have of participating in a future that we help shape depends not only on our ability to accurately foresee the future, but on our agility in responding to future-shaping world events.

ASQ's 2002 Futures Team comprised a diverse group of 16 people who devoted two days to exploring the future. They were guided by representatives from the Institute for Alternative Futures and aided by the results of an international Delphi study, which gathered several dozen social, political, economic, and technical forces that could shape the future of quality. I want to personally thank everyone who contributed to this project. Their time and talents will benefit ASQ and its members as we all prepare for the challenges of the future.

The results of this study will be reflected in ASQ's 2003-04 strategy. We intend to revisit the study regularly as we move toward an "evergreen" strategy. In the not-too-distant future, the pace of change may dictate that ASQ conduct an ongoing Futures Study and that our planning process be continually adjusted as the "future" and "now" become less distinguishable.



ASQ President-Elect
 2002-03

The Futures Team identified seven key forces that are most likely to shape quality in the foreseeable future. These key forces are important for ASQ and for quality professionals because they set the tone for how we must be braced for the challenges that lie ahead.

**1 QUALITY MUST DELIVER
 BOTTOM-LINE RESULTS**

To demonstrate quality's true impact and investment value, we must fully engage the language of finance, economics, and business. This must become our own natural language, not a foreign language.

**2 MANAGEMENT SYSTEMS INCREASINGLY WILL
 ABSORB THE QUALITY FUNCTION**

The quality profession will be difficult to define as quality is further decentralized and becomes an integral component of good management. The role of the quality professional is shifting from "doing quality for employees" to "coaching employees" to do it for themselves.

3 QUALITY WILL BE EVERYONE'S JOB

We have an opportunity to develop the practices and understanding of the future work force by introducing continuous improvement and other quality processes in the educational system. Six Sigma, for example, has accelerated this trend by bringing advanced quality tools into the hands of top performing business managers, who comprise the majority of Black Belts.

4 THE ECONOMIC CASE FOR A BROADER APPLICATION OF QUALITY WILL NEED TO BE PROVEN

In order for quality methods to be applied to large-scale social and environmental problems, economists must be engaged to link the cost of quality to its benefits. The bottom-line impact of Six Sigma to corporations can help make this case, bearing in mind that cost reduction is only one dimension of quality.

5 GLOBAL DEMAND FOR PRODUCTS AND SERVICES WILL CREATE A GLOBAL WORK FORCE

Large corporations increasingly transport employees from country to country as projects, profits, or productivity demands. These new "global citizens" are joined by virtual employees who telecommute in a global knowledge community.

6 DECLINING TRUST AND CONFIDENCE IN BUSINESS LEADERS AND ORGANIZATIONS

Consumers will become increasingly conscious of and responsive to the perceived ethical conduct of the organizations they patronize. The ethical aspects of a growing number of issues and decisions will assume greater importance and be more visible.

7 RISING CUSTOMER EXPECTATIONS

Consumers who have become accustomed to speed, efficiency, and excellent customer service when conducting business over the Internet will demand the same in retail transactions. Government, public service, and charitable entities also will be measured against these Internet-driven benchmarks.



Armed with Delphi study trends and the key forces shaping quality, the ASQ Futures Team developed four pictures of what society might look like in the not-too-distant future. These scenarios are composite descriptions of four different futures influenced by the same trends. The Futures Team updated the 1999 scenarios, most notably by projecting how society will cope with terrorism threats.

Each scenario is considered plausible, depending on the collective choices that we make. We can all use these scenarios to stimulate thinking about how we as quality professionals can help shape the likelihood of a desirable scenario becoming reality.

Scenarios are also useful because they help ASQ focus on important implications for the Society's future. They are an invaluable strategic planning tool, as you will discover in the sections that follow the scenarios. By organizing trends into alternative future scenarios, we can test and create robust strategies in order to create the future we desire. As such, scenarios not only allow us to understand the future, but they can become drivers in creating the future as well.

The scenarios presented here have been condensed for easier comprehension. A more in-depth analysis of each scenario is available on our Web site: WWW.ASQ.ORG.

"I believe that these Futures Studies are a unique opportunity to bring quality to the highest strategic levels, as the scenarios suggest. ASQ should fully seize this opportunity...I think that it should be made clear that when we speak of bottom line we do not limit it to the traditional bottom line: money. The bottom-line concept should be extended to incorporate the benefits for all the stakeholders."

TITO CONTI
 ASQ FELLOW

SCENARIO THE FRUITS OF KNOWLEDGE

1 In this scenario, the fundamental elements of quality management have been instrumental in realizing the benefits promised by technology advancements and the dissemination of knowledge. The world has become a safer and more equitable place for most of humanity.

INTERNATIONAL

- The elevated profile of quality in the business world has prompted governments to adopt proactive quality policies, which accelerated democratic and economic reforms.
- Economic turnarounds in Russia, Brazil, and Cuba are among the major successes, helped in part by the International Monetary Fund.
- Technology advancements, working hand-in-hand with government reforms, have raised living standards and spurred poor nations toward self-sufficiency.

SECURITY

- The terrorist attacks of the early 21st century were a rallying call for the quality profession.
- Quality professionals have become strategic partners with other experts to design and develop systems to ensure the security of our communities' infrastructures, their ability to respond effectively to emergency situations to significantly limit damage, and the world's ability to transport goods and information without fear of terrorist manipulation.

- The quality profession also helps to ensure personal security with respect to growing concerns over privacy and identity theft.

BUSINESS AND CONSUMERS

- Mergers and alliances have revamped business. Companies are complete value chains of interlocking collaborative alliances, with three or four such competitors in most industries.
- Every product and service is now couched as an "experience" to appeal to history's most demanding consumer base. Competitive differentiation centers on personal, information-rich, and up-to-the-minute service.
- Successful organizations have seamless end-to-end distribution systems with consumer demand visible from all points.

SOCIAL RESPONSIBILITY

- Organizations must be exemplary corporate citizens and environmental stewards because their every move is monitored and broadcast by consumer groups.

- Quality's emphasis on performance measurement has led to the development of social responsibility measures for all institutions.
- In addition, quality has been integrated into nearly every aspect of our personal, professional, and community lives, creating a new model for quality of life and civic responsibility.

THE QUALITY PROFESSION

- Quality professionals are fewer in number, but higher in status. They serve as university presidents or deans, or in business as strategic change agents and knowledge managers who design and manage quality systems, train other managers, and monitor performance at their own and competing organizations.
- They are expert at exploiting knowledge to enhance their organizations' performance.
- ASQ leads by helping quality professionals (and others) in personal development and providing a "knowledge hub" that allows them to translate quality's core messages throughout society.



SCENARIO BACK TO THE PAST



This scenario describes a vicious cycle of economic and environmental disruption, ineffective leadership, and social fragmentation. The quality profession has dwindled to near-extinction as a result of disenchantment with its outcomes, institutional cost reductions, and the profession's failure to grasp the seriousness of the situation and respond proactively.

ECONOMIC HARDSHIP

- The effects of the 2009 stock market crash are still being felt, long after millions of investors went bankrupt and the nation experienced wave upon wave of layoffs.
- Inequities between the wealthy few and the desperate masses led to breakdowns in social cooperation and communication.
- Economic hardship in developing nations unleashed a backlash against globalization and Western influence. The gulf and acrimony between the "haves" and "have nots" of the world's nations have intensified.

PUBLIC HEALTH

- Biotechnology research and development is out of control.
- Corporations ignore ethical and quality concerns in pursuit of profits. Lethal microbes have fallen into the hands of terrorist groups, who have obtained the power of the Mafia in the early 1920s United States.
- Depression is the world's most prevalent health concern, followed closely by poverty and hunger.

- Around the globe, social safety nets have ruptured, leaving millions of people facing poverty and illness.
- Disease and death have escalated because of errors within patient care systems.

ENVIRONMENT

- Ecological disasters have piled up. In the United States, after funding cuts forced the Environmental Protection Agency to curtail enforcement, companies have begun ignoring quality-based regulations.
- Nuclear waste has contaminated water supplies because quality standards for its storage have not been met.
- Ozone depletion has resumed as a result of careless disposal of chlorofluorocarbons.
- Terrorists have exploited these weaknesses, unleashing biowarfare strikes.

"The maturation of quality is a major force for ASQ, and it demands different organizational responses, strategies, and approaches....The key finding of the first Futures Study is that the only thing we know for sure about the future is that whatever we predict, something different will happen. The conclusion was that ASQ must be and remain adaptable. ASQ must be quick to sense change, and quick to respond to change. Sensors and response capabilities must be in place and be ready to take action."

DAVID B. LUTHER
ASQ PAST PRESIDENT

THE QUALITY PROFESSION

- The quality community's absence in the development of the knowledge economy—coupled with resistance to change among a core of quality professionals—kept the profession out of debates that framed the concepts of knowledge management.
- The profession, therefore, lost its influence on society's economic efforts for the future.
- Ongoing recession has been prolonged, in part, by the failure to apply quality methods to financial institutions and other elements of the global economic infrastructure.
- ASQ membership has shrunk in half, forcing the demise of *Quality Progress* magazine and many other programs.

QUALITY'S LOST OPPORTUNITIES

- Quality professionals could have encouraged governments to develop better processes for oversight and management of technology.
- They could have revived conversations about the sustainability of business methods and opened debates on how to measure quality of life.
- Quality methods could have been used to identify and eliminate the root causes of criminal activity.

SCENARIO SUSTAINABILITY

3

In this scenario, sustainability is the central organizing principle for society. Quality is recognized as the best approach for achieving sustainability. Quality philosophies, techniques, and tools have become ubiquitous. However, much of this progress has been achieved at the price of stronger, larger government. There is a foreboding rise in paternalism and authoritarianism.

GOVERNMENT

- Two decades of worldwide turbulence have pushed society to a sustainability paradigm.
- Environmental crises, economic meltdowns, social violence, and international terrorism have led shell-shocked citizens to turn to government for an end to anarchy and environmental destruction.
- National governments have become stronger. Public order has tightened and crime has declined, at the expense of civil liberties and freedom of information.
- Government is unified on a global basis with a single world currency.
- Local governments, however, manage cultural uniqueness.

ENVIRONMENT

- In 2019, environmental sustainability became a regulatory mandate, backed by the Clean Earth Policy established at the 4th United Nations Conference on the Environment and Development. A conference highlight was an ASQ presentation on the Society's groundbreaking work in sustainability.

- The policy is enforced nationally and internationally, and consumers vote with their wallets if a company is noncompliant.
- The technological tide is turning from profit-driven research and development toward technologies that support social and environmental wellness.
- Government-sponsored R&D has produced amazing biological remedies, like mass farming of ocean algae to restore the ozone layer.
- Cellulose-based ethanol distilled from plants has replaced petroleum fuels.
- Benign methods of weather control have eliminated the destructive effects of natural disasters.
- World population is stable at 8 billion, as women have attained political influence, education, and employment in most societies.

CONSUMERS

- Since 2009, mass customization has been the rule for information products. Many goods self-adapt to changing user needs by intelligently monitoring usage patterns.

- Distinctions between product and service are blurred in a customer-centered experience.
- Consumer choices are made more on the desire for "experience" obtained with the product than on its practicality or quality.

THE QUALITY PROFESSION

- Environmental standards, based on quality principles, are implemented worldwide to ensure a sustainable planet. The Global Quality Council mediates world business disputes.
- A global acceptance of nanotechnology has led to development of standards to monitor and control research (e.g., cloning).
- Looser restrictions on national work permits have created a near-global talent pool and induced governments to focus quality tools and techniques on creating attractive work-and-live communities.
- Through the efforts of the quality community, a set of standards governing organizational ethics has been universally credited with the return of consumer confidence, the resultant stabilization of the stock market, the rise in respect for business leaders, and the increase in real organizational value.



SCENARIO THE GARDEN OF QUALITY



4

In this scenario, the world has truly become a global village. We've progressed from allowing technology to drive business and business to drive society, to subsuming technology to human and biospheric well-being. Most large institutions are fraying, giving way to fluid, evolving, human-centered systems based on trust and mutual benefit. Communicating worldwide is as easy and prevalent as breathing. Quality is embedded in every sphere of activity. People work within affined communities to pursue common goals for human betterment.

SOCIETY

- Snowballing social, global, and ecological crises made us realize we had to change quickly, prompting a mandate to reorganize society around personal, social, and environmental well-being.
- Cooperation and collaboration are the organizing principles, building off the successful global antiterrorism coalition.
- ASQ maintains a huge library of best practices on the global quality network.
- Creating products and services that contribute to human betterment has replaced consumption as an economic engine.
- Military services have been replaced by peacekeepers who go where needed to resolve conflicts between or for organizations.
- Racism is eliminated. Women are at last truly equal to men.

TECHNOLOGY

- Most social problems are solved at the local or regional level, with leaders cooperating intensively via the Internet.
- Artificial intelligence is integrated into most systems, providing error-free service and freeing humans to pursue breakthrough thinking.
- Illness is nearly extinct, thanks to prevention-oriented lifestyles and genetically based customized medicine.

ENVIRONMENT

- Researchers are using satellite networks and DNA supercomputers to map the interactions of Earth's biosphere and atmosphere. This allows quality methods to be applied to counter the ecological legacies of the 20th century.
- Quality systems are being used to identify and eliminate the negative impacts of all human activity.
- The paradigm of mankind having dominion over other animals and plants has been replaced by the realization that we are part of the biological community we call Earth.

- Humans have accepted the data that told us we were destroying our host, as we determined our very survival depended on valuing interdependence.

THE QUALITY PROFESSION

- In the 2010s, we accepted quality as a guiding principle and radically reshaped society at all levels.
- Quality moved up the value chain to become an ethic—more than a set of principles and practices.
- Quality has gone beyond making the world better for consumption to addressing the broader issues of creating and sustaining a civil society.
- ASQ is globally recognized as a model for co-creating the future with other cutting-edge organizations on a variety of topics, and for its contribution to world peace.



"I believe that in this 21st-century, academia will be creating degree-granting schools of managing for quality; also that there will emerge the Quality equivalent of the CPA. If that view is correct it would be in order for ASQ to help bring it about. Congratulations and best wishes."

DR. J.M. JURAN
ASQ HONORARY MEMBER

BY CAREFULLY ANALYZING THESE SCENARIOS,

WE CAN PROJECT HOW THE MAJOR TRENDS EMBEDDED IN THEM ARE LIKELY TO IMPACT SOCIETY, QUALITY PROFESSIONALS, AND ASQ IN THE YEARS AHEAD...

IMPACT ON SOCIETY

AGING POPULATION

The population of the developed world is aging, but in developing countries it is exploding. This will further deplete natural resources and strain the health care systems of these countries. Up to half the population of nations such as Mexico and India is under the age of 20. The middle class in China equaled the population of the United States in 1999, and as it ages it will shift the economic power of the world.

SUSTAINABILITY OF LIFE ON EARTH

We are approaching a golden age of environmental protection and sustainable development. Sustainable development will not only protect Earth's resources, but also become the preferred stimulus of economic growth. There is a tremendous opportunity for governments and businesses to provide the systems that will accelerate progress toward sustainability.

RENEWABLE ENERGY SOURCES

Renewable resources such as wind, solar, hydro, geothermal, and biomass gradually will replace fossil fuels and nuclear energy as the primary source for power generation. As these technologies improve, they will

become more affordable and society will realize that dependence on traditional energy sources is foolhardy. This trend will accelerate when fossil fuel availability is reduced, costs escalate, and supplies become traded as political currency.

INTERNET USAGE GROWTH

Internet usage will continue to grow, with remarkable progress made in the developing world. Internet usage in the Third World will help certain educated populations leapfrog in the 21st century economy as active consumers, as well as producers of online education and consumer products. The Internet will finally achieve its potential as a business-management and product-development tool. However, security measures will have to be overcome if corporations are to trust the Internet for product development, which involves proprietary information. Otherwise, dedicated broadband private services will replace the Internet for all but its mass-marketing capabilities.

IMPACT ON QUALITY PROFESSIONALS

DISPERSION OF THE QUALITY FUNCTION

Quality will be more important than ever for organizations of all varieties, yet standalone quality departments and professionals with the word "quality"

in their title will continue to decline. The tools and body of knowledge of quality will be adopted by more types of people in a wider spectrum of organizational settings. Therefore, it will become more difficult to define who and what constitutes the "quality profession." Instead of operating within a quality department, practitioners will more likely be dispersed throughout an organization. They will need access to quality tools and will need to possess the skill sets required to function in this new setting.

INTEGRATING QUALITY AMONG EMPLOYEES

This new environment may be overwhelming, but it can open up new possibilities for the quality professional. The role of future quality professionals will be as technical coaches and mentors. They will lead by virtue of a deep commitment to fundamental business improvement that comes from their knowledge, skills, and attitudes about solving problems democratically. They will recognize the value of teamwork. We need to develop these types of skills among our best and brightest.

NEXT GENERATION OF QUALITY TOOLS AND TECHNIQUES

Creation of the next accepted set of quality tools and techniques will require a mindset change—an

acceptance of approaches that appear counter to current quality approaches. For example, instead of trying to sell universities on a full-level academic quality department, quality professionals should be encouraging multidimensional quality hubs. ASQ itself could push for adding the study of quality principles and management as a business school requirement for future managers and executives.

THE HUMAN SIDE OF QUALITY

Innovators and others will be forced to consider the human element when developing and introducing new technologies. Concern that our relationship with technology is intruding on our relationships with people will propel the “appropriate use” (or “simple”) movement. The key phrase here is simple and its corollary enjoyable. The increasing complexity of life and the speed of change will create a premium on those things that simplify life in enjoyable ways.

THE ECONOMICS OF QUALITY

The economics of quality will re-emerge as the most critical dimension of quality. It always has been, but it was recognized as critical by executives who inherently believed in the link between economics and quality. Today's executives, however, are looking for more direct evidence. This means we must be comfortable talking

with executives in their language—that of finance, economics, and business.

IMPACT ON ASQ

THE ECONOMICS OF QUALITY

ASQ must deliver answers to those who ask us to prove that quality delivers financial results. Despite the American Customer Satisfaction Index (ACSI) and the Baldrige (Stock Investment) Index, the marketplace is not convinced that quality pays. Economists must make this linkage, otherwise quality principles will not be applied on a broader scale to help combat environmental and societal ills.

MEANING

People are searching not only for value, but also for meaning from the groups they belong to. There is growing anecdotal evidence that the search for meaning, or its satisfaction through affiliation, will be a significant decision-making consideration of Generation X and the Millennium Generations. Associations that make meaning a conscious dimension of their mission and presence are likely to fare well. Meaningful purpose, meaningful relationships, meaningful stories, and meaningful contributions will take the place of an

association offering only “products” such as certification, publications, and job banks. ASQ members need to feel that the Society is helping to make the world a better place.

GLOBAL PRESENCE

ASQ members increasingly will live outside of North America. They will be working for global companies that have global suppliers and global customers. There will be challenges and opportunities for understanding global cultures and aiding ASQ members who live in a world without boundaries. Individuals will want to be associated with fewer groups and will want one source for professional information. Associations that establish a worldwide position, with members across the globe, efficient offerings over the Internet, local partnerships, and so on, are the most likely to succeed.

INCLUSIVITY

ASQ must do a better job of including practitioners of quality who are not dedicated quality professionals. With declining numbers of quality professionals and increasing numbers of practitioners, our future is limited unless we change. The ASQ of the future, while honoring and valuing the quality professional, must open its doors to everyone who has an interest in and desire to use the technologies of quality (both hard and soft). This reality

LEARNING FROM PREVIOUS FUTURES STUDIES

THE TWO PREVIOUS FUTURES STUDIES PROMPTED ASQ TO INITIATE SEVERAL IMPORTANT CHANGES TO BETTER PREPARE FOR MEETING THE CHANGING EXPECTATIONS OF EXISTING AND PROSPECTIVE MEMBERS. THE FOLLOWING LISTS SHOW THE MAJOR CHANGES RESULTING FROM THE 1996 STUDY (QUALITY, THE FUTURE, AND YOU) AND THE 1999 STUDY (FORESIGHT 2020).

will have a resounding impact on our offerings. Inclusivity also means collaborating with a wide variety of related organizations, such as SME, APICS, ASTD, ASA, and SAVE. However, we need a clearly defined strategy for which organizations we are targeting and how each partner will benefit.

SPEED AND AGILITY

In the future, scientific discoveries and technological innovations will accelerate change and shorten life cycles for everything—including ASQ's activities. We must therefore develop a dynamic capability to monitor the future as it unfolds in the present, and also to develop a constantly evolving strategic plan. The need for rapid decision-making will intensify, but even more critical will be the ability to reach the market quickly. And with ever-shorter life cycles, knowing when to withdraw from the market will become nearly as important as when to enter it.

NEW TOOLS FOR NEW PEOPLE

ASQ would do well to understand how it can become relevant to police officers, nurses, farmers, welders, mechanics, teachers, lawyers, mayors, social service providers, baggage handlers, and people from all walks of life.

AFTER THE 1996 STUDY...

- The word "Control" was dropped from the name of the Society.
- A constitutional convention was conducted to modernize and streamline our Society's system of governance to make ASQ faster and more agile.
- Specific strategies were developed for technology utilization, global partnering, and research to push the limits of our body of knowledge.
- ASQ invested heavily in implementing our technology strategy to bring us into the forefront of professional associations.
- ASQ's vision and mission statements were updated to reflect our new direction and to focus our strategic plan on becoming a leader in performance excellence.

AFTER THE 1999 STUDY...

- The Six Sigma Forum was launched to support the new community of Six Sigma practitioners.
- Quality's higher purpose was adopted as a strategy to improve society through ASQ's Good Works initiative.
- ASQ formed affiliations with the Association for Quality and Participation (AQP), the National Patient Safety Foundation (NPSF), and the QuEST Forum.
- The European Organization for Quality (EOQ) and several national quality institutes joined forces with ASQ as WorldPartners to advance individual and organizational performance globally.

"This brochure identifies the demand for more fully reaching new marketplaces for quality services and for, in effect, developing the new 'business management model' to guide and focus the strategic and tactical changes required. This demand should not be too surprising in light of the many other business management model changes taking place throughout corporate America in the organizations that employ much of both ASQ's current membership as well as its not-yet-served constituency."

DR. A.V. FEIGENBAUM
ASQ PAST PRESIDENT
ASQ HONORARY MEMBER

HOW ASQ MUST CHANGE

BUILDING A PREFERRED FUTURE—WHETHER FOR AN INDIVIDUAL OR AN ASSOCIATION—BEGINS WITH A VISION. THE FUTURES STUDY TEAM CONSIDERED HOW ASQ'S CURRENT OFFERINGS AND ACTIVITIES NEED TO BE ADJUSTED TO EFFECTIVELY SERVE MEMBERS IN THE YEARS AHEAD. USING THE KEY FORCES AND SCENARIOS AS A GUIDE, THE TEAM DEVELOPED LISTS OF STRETCH GOALS AND AIMS FOR THE SOCIETY. THESE WILL BE INCORPORATED INTO OUR STRATEGIC THINKING FOR 2003.

TOP NEW OR RESTATED AIMS FOR ASQ TO CONSIDER...

- 1 Improve the outcomes of organizations by making them more competitive.
- 2 Empower people to improve their impact in the workplace through training and certification.
- 3 Reduce waste in all of its forms, including time, money, materials, and pollution.
- 4 Contribute to a better society, one in which decisions and actions are based on the widespread use of quality concepts and tools.
- 5 Improve the quality of products and services consumed.
- 6 Inspire personal improvement.
- 7 Develop leaders of quality, even though they may not be identified with the word "quality."
- 8 Improve the environment through the use of quality-based design principles that consider the entire product life cycle, clear through to disposal or reuse.
- 9 Use quality to enhance outcomes of specific sectors such as education, health care, and government.

2002 FUTURES TEAM

Jennifer Admussen, YWCA

Christopher D. Bauman, Director Finance and Technology, American Society for Quality

Clem Bezold, Institute for Alternative Futures

Paul Borawski, Executive Director, American Society for Quality

Dr. Kenneth E. Case, Regents Professor, Oklahoma State University

Daniel M. Duhan, Business Operations Manager, Northrop Grumman

Steven Hoisington, Vice President Quality, Johnson Controls

Jad G.B. Jadunath, Keller Graduate School of Management

Elizabeth M. Keim, Managing Partner, Intergrated Quality Resources, LLC

Robert H. King, CEO and President, Registrar Accreditation Board

Brian J. LeHouillier, Director Programs and Operations, American Society for Quality

William H. McEachern, Professor of Business and Management, Alverno College

Thomas J. Mosgaller, Organizational Development Director and Human Resources Officer, Marshall Erdman and Associates

Debra Phillips-Donaldson, Editor, *Quality Progress*, American Society for Quality

Richard J. Sandretti, Director Market Research and Public Relations, American Society for Quality

Sheila T. Zelenski, Director Membership, American Society for Quality

American Society for Quality



600 N. Parkview Ave.
P.O. Box 3005
Milwaukee, WI 53201-3005
414-272-6575
Fax 414-272-1734
800-248-1946
Web site www.asq.org

2005 ASQ FUTURES STUDY

In the Chase



ASQ

AMERICAN SOCIETY
FOR QUALITY®



In the Chase

In auto racing there's a rule: The faster you go the farther ahead you have to look. Details that you can see at 60 miles per hour become a blur at 120 miles per hour. At 120 you focus on the big picture. Not looking far enough ahead is perilous in driving. The same is true for your career. Clearly the skills that are your stock and trade today will not assure your continued success five years from now. If you're not doing something about that fact, you're being outmaneuvered by those who are.

The same can be said for the quality profession as a whole and for all types of organizations.

Which is certainly a timely thought for ASQ as it celebrates its 60th anniversary this year.

Looking back at our 60 years of change, I have often wondered what our forward-looking ASQ founders were thinking back then. Had they attempted to foresee the year 2000 and what quality might become at the turn of the new century? One of the most noteworthy of those pioneers, Joseph M. Juran, gave us a vision that still gets my motor running:

“The 21st century will be the century of quality.”

That worthy aim and all the benefit to society that it promises is (or should be) the rallying call for the quality community. How is it that ASQ can best play its role in assuring that Dr. Juran's vision becomes reality?

This Futures Study, and the dialogues it should prompt, is one such role. ASQ can draw your attention to the future and provide you with a frame for looking at the future.

Success in any racing situation also depends on undergoing thorough preparedness and training; going into the competition with a well thought-out strategy and then playing it out with patience and pacing; being willing to adapt the plan to changing conditions as the race unfolds; and finally knowing when to make the move. ASQ can also assist individuals and organizations in these areas as well.

I'm all but certain ASQ's founders could not have foreseen the accelerating rate of change we live in. Why am I so sure? Because the biggest “miss” of our series of Futures Studies (1996, 1999, 2001, 2005) has been our miscalculation of the increasing rate of change. All Futures Studies miss this, and futurists will be first to say the greatest challenge of futuring is to be able to suspend the present in order to imagine the future. Our imaginations are just not fit enough for the task. Why? Perhaps we're so focused on today that we don't exercise our anticipatory skills.

I guarantee this forecast of the future will be wrong. Predictions of the future are always overcome by events that can not be anticipated. Do you think ASQ's founders could have anticipated Total Quality Control, or the Malcolm Baldrige Award? Do you think they could have foreseen ISO 9000, or Six Sigma? It is certain that events we cannot predict will change the terrain, sometimes instantly, sometimes over time. That doesn't mean studies of the future are therefore meaningless. Directionally they are valid. The world is changing and being shaped by the forces the study identified. Anticipating is an increasingly valuable skill. It's a competency every organization is working to grow. Anticipation gives an organization advantage over its competitors and gives you advantage in your career.



Those who anticipate have advantage over those who don't. ASQ has set the stage for you and we invite you to plan for the future. ASQ is working to make Dr. Juran's vision a reality. It won't be possible without legions of skilled professionals prepared and outfitted to be relevant to the needs of organizations. Or without ASQ Sections, Divisions, and Forums preparing themselves to assist you with the knowledge, education, and skills you will need. ASQ's board is investing in making sure a contemporary Body of Quality Knowledge is at your fingertips.

The future of quality is exciting for those who embrace it. Clearly our view of quality is a gift from the past generations on whose shoulders we stand.

I applaud ASQ's board for their commitment to undertaking these studies and for having the courage they've mustered to discuss the future and enable changes that you will be the beneficiary of.

If your career is quality, this Futures Study is your invitation to go once around at 120 miles per hour. Because no one but you can run your race. Get up and anticipate your future. Take this brochure and make the future of quality your topic of lunch conversation with your colleagues. Be bold enough to ask your section to host a Future of Quality Dialogue—and then make sure the right people attend.

Identify the skills you think you'll need to grow in value and get started. While you're at it, beat the drum for quality. Become fully engaged in the great race to make the 21st century the century of quality.

This booklet is meant to be a guide to help you and your organization remain in that chase whatever comes your way.

Paul E. Borawski, CAE
Executive Director & Chief Strategic Officer
American Society for Quality





Futuring is a structured look ahead aimed at enhancing anticipatory skills. ASQ has used futuring for 10 years as part of its strategic planning and repositioning for change. The first ASQ Futures Study, conducted in 1996, proved so fruitful the Society's board of directors elected to repeat it every three years, with studies in 1999, 2002, and, most recently, 2005. The board sees futuring as a valuable way to expand input into planning, taking into account not only the present situation but also the worst, preferred, and best cases for tomorrow.

The 2005 ASQ Futures Study included three important steps:

1. Identifying the key forces that will shape the future of quality.
2. Developing scenarios of how the forces might unfold.
3. Determining the implications for organizations and the quality field, quality professionals, and ASQ.

Key Forces

To single out the most important forces that might shape the future, ASQ involved 62 people representing many countries and regions of the world—including executives from nine national quality organizations—as well as diverse economic sectors.

The participants in this stage used the Delphi technique of multiple approximations, which involved several rounds of electronic, anonymous exchange and selection of ideas, seeded with 63 forces from reference sources and past studies. From that process came six key forces of change, ranked in order of perceived significance:

- 1. Globalization.** While certainly not a new phenomenon, this force may have different implications for quality in the future. Some experts see globalization as a continuing threat to the United States; others view it as an emergent massive market of opportunity. Organizations will be shaped by the fluidity of the Internet, unencumbered by legacy infrastructures and impacted by shifting trade politics. This new world order will demand new kinds of collaboration, have implications for global vs. multinational companies, carry an unknown competitive intensity, and drive preoccupation with the bottom line.
- 2. Innovation/creativity/change.** New to the screen, this force highlights the need to exploit quality's contribution to the "top line"—in other words, design quality in up front. Under this force, knowledge is king and becomes a currency. Nanotechnology, biotechnology, mass customization, and personal manufacturing dramatically change the nature of production. Innovation seems a natural response to dealing with increased rate of change, shorter life cycles, and rising consumer sophistication; yet reacting quickly is unnatural for people and organizations. There will be increased demand to develop systems for sensing change and accompanying implications for the traditions of quality: How will control and continuous improvement co-exist and evolve in response to these demands on organizations?
- 3. Outsourcing.** Described as globalization's first cousin, outsourcing suggests work will become increasingly independent of place and space. We are entering an era of virtual companies that will be formed from the core of business marketing and management. Quality will be shaped by people-induced variation and extend increasingly into global supplier networks. Some experts predict a swinging pendulum in outsourcing, with jobs returning to developed countries.

- 
- 4. Consumer sophistication.** Today's consumers already have very high expectations for the products and services they buy, and those expectations will only continue to rise, encompassing product quality, seamless delivery, ever shorter life cycles, and fresh features. Quality is necessary but no longer sufficient. Enabled by instant Internet knowledge, consumers will control markets and willingly trade national loyalty for the right cost/benefit ratio. The quality of consumer experiences will become a stronger influence. This presents a challenge but also a silver lining for quality professionals. Anticipatory skills will grow in value.
- 5. Value creation.** Soon, determining the value proposition of any product, service, or business will require clarity and definition from the stakeholder's viewpoint. Perfect quality and flawless service won't be enough. Management systems must adapt accordingly. In this world, value includes sustainability, the triple bottom line (societal, environmental, and financial results), and elimination of waste. Quality will have to create value in everything that is done.
- 6. Changes in quality.** In the future, quality will need to be redefined to fit the needs of 21st century organizations. It must evolve from a process model to a systems approach. Customers and organizations will place a premium on anticipation, the ability to be first to market, initial yield, agility, and supplier network management. Quality will move business strategies into actions through people. Professionals with people skills will be the employees in demand. Other, less significant factors that will influence quality in the future include mass customization, social responsibility, the top line (revenue and sales), virtual society, waste elimination, learning, and people management.

Scenarios

How Might the Chase Play Out?



To continue exploring the 2005 forces of change, the International Academy for Quality (IAQ) and ASQ held a daylong workshop during the World Conference on Quality and Improvement in Seattle last May. The more than 100 participants represented 18 countries.

Using a group exercise called the World Café, the participants discussed and brainstormed on the six forces of change to develop scenarios answering these questions:

- What can we learn from considering how these forces might play out in the future?
- When we look out 10 to 15 years, what might we see that is most important to the future of quality?
- How can we use our collective wisdom around these possible futures to our strategic advantage?

8

Greg Watson, an ASQ past president, IAQ academician, and current International Chapter chair, developed the outcomes of the exercise into four possible scenarios:

1. Reality therapy—same path we're on. The world has continued a slow decline in all performance indicators since the beginning of the century. The purchasing power of average income, as measured by a market basket of economic goods, has steadily eroded to the point where the cost of life staples (food, energy, clothing, transportation, and housing) has reduced the global standard of living for the majority by 50% over the preceding two decades. The world has experienced global terrorism in all major countries, which has heightened the distinctions between the 'have' and 'have-not' nations and caused a backlash against

the goods produced by multinational corporations—the visible, global presence of the 'have' minority.

Here is how the various key forces would play out in this scenario:

- Globalization—separation of 'have' and 'have-not' countries.
- Innovation/Creativity/Change—technology innovation focused on 'have' nations to control the impact of the 'have-not' nations.
- Outsourcing—high-value-adding jobs are maintained in the 'have' nations while the 'have-not' nations struggle to gain.

- Consumer Sophistication—The 'have-not' world seeks to increase participation in the global environment by operating lean organizations, applying virtual technology to the development of software-based and service products, and learning lessons from the 'have' world that can increase their influence on the global economy. Trade cartels and buying groups are developed across the 'have-not' world in order to enhance their economic power in the global market.
- Value Creation—Tiered product structures deliver differing quality propositions to the 'have' and 'have-nots'—with mass customization available for 'have' customers and 'mass production' to the 'have-not' customers.



- **Changes in Quality**—The role of quality in this scenario has two distinct focus areas. In the ‘have’ world the emphasis is on increasing the top-line growth of the organizations through the design, development, and deployment of products and services that are effective, efficient, and economic from the consumer’s perspective—while highly profitable from the company’s viewpoint. In the ‘have-not’ world, the role of quality focuses on the increase in participation and problem-solving to assure that the world is more transparent and that governance is executed in multinational corporations with an eye toward ‘inclusion’ and social responsibility.

2. Pluralistic world—possible and plausible. The world has awakened to the need for its organizations to establish alliances among similar entities and build an infrastructure capable of effectively and efficiently addressing global problems: pollution, poverty, population control, health and sanitation, global warming, and sustainable growth. The impact of terrorism is on the decline as nations have banded together against it as a common evil. While a pluralistic construct is widely accepted as an operating definition of social democracy, much work remains to ensure the have/have-not distinction is overcome by a world view that seeks good for all people. Perfection has not been achieved but the effect of the pluralistic focus is being felt in the former Third World countries.

- **Globalization**—The global service environment increases as nanotechnology is able to micro-miniaturize many physical transformations that previously defined unique products (e.g., medicine) and create a stronger emphasis on business processes that flow the raw material to the ‘nano-factory of the future’ and

increasingly software manages the operations of the factory and controls the economic operating core of business. This value-adding capability is being distributed for consumption by local markets.

- **Innovation/Creativity/Change**—Technology drives innovation, and packaging of functionality into converged products establishes a hybrid, truly customized product for personal communication called ‘the thinking machine’ that provides these capabilities in the form of an ‘electronic wallet.’
- **Outsourcing**—Outsourced capabilities lead to value-adding business opportunities as the content of the work becomes enriched over time. The concept that ‘each market serves itself’ becomes the watchword for distribution of global production resources.
- **Consumer Sophistication**—The sophistication of consumers reaches a plateau as all of the consuming markets seek the best quality and no market is willing to take the second-best or ‘old technology’ solution.
- **Value Creation**—Value is personalized so that each person can receive products or services the way that they want them (locally customized with options that fit a fixed menu that is locally defined).
- **Changes in Quality**—The concept of quality has merged to a user-specific definition where it means the ability to consistently ‘get the customer’s job done, the way that the customer wants it done!’ This means both designing products

that customers really need and consistently delivering the 'designed-in' quality performance. This change in quality drives Six Sigma quality into a world of product and service design.

3. Global warming—bad news. While the world has focused on political issues such as poverty and terrorism, it has reduced its commitment toward a sustainable environment that will be safe for future generations of mankind. As an outcome of this ignorance and the consumption of hydrocarbons, global warming has become systemic, and the ozone layer has been penetrated in multiple areas. The net result of ignoring the environmental effects of business and social decisions is creation of a world where the deserts are reclaiming the forests and fields at ever-increasing rates of biological transfer. As the business world becomes aware of these concerns, there is a ripple effect through the high technology markets which are dependent on energy consumption and clean water to effect their product transformations. Nanotechnology has not matured at a rate fast enough to provide salvation from these effects and the result is public boycott of the products that abuse the environment. This in turn creates a special need for business to focus on quality of the environment, including the improved management of its people resources. The resources of the world are being consumed in a battle to correct all of the deficiencies of past generations and assure the survival of mankind on the planet. Out of panic, humans take many parallel actions but do not use the systemic tools of quality to continuously improve the environment. It is fast becoming a case of too little, too late, with not enough focus.



- Globalization—The world is in a crisis—and it has become focused because the gradual function that was assumed for global warming was not true, but it took a rapid disintegration that caused the average daily temperature to drop 10 degrees Fahrenheit in just a three-year period. There is no longer any way to avoid the new confrontation with environmental issues.
 - Innovation/Creativity/Change—All of the world's resources and thinking power are brought to bear on the problem of environmental correction. The trouble is that there is a lack of collaboration and no process for achieving consensus about what to do. The ability to manage global resources is being threatened by the lack of trust among the different interest groups who are all seeking self-preservation and jockeying for power positions in the evolving new world order.
 - Outsourcing—Outsourcing drops in popularity as a strategy as nobody is willing to give away jobs or economic advantage to other global regions. Countries or regions of the world become increasingly isolated and insular.
 - Consumer Sophistication—Politics determines the customer for correcting the world environmental crisis—this is defined purely by military and economic might. The potential exists for global conflict over the need to take actions to clean up the world.
 - Value Creation—The value system of the world has shifted so that there is only one standard for evaluating 'goodness'—the impact on the environment and the ability to reverse the effects of years of negligence and abuse. The potential solution is highly influenced by a new way of engineering—applying statistical concepts and methods to assure robust design of environmental support and management systems. But, the lack of political and economic focus stands in the way of achieving a global solution.
 - Changes in Quality—The environment is job one under this scenario and the ability to use quality philosophies, methods, and techniques to turn around the global warming effect is seen as the number one imperative of mankind.
- 4. Innovative edge—best of all worlds.** Top-line integration of resources has effected global, systemic change in areas important for a sustainable planet.

Nations have struck a balance between the need for economic development and an environment able to sustain mankind. The appropriate use of technology has eliminated risk of potentially destructive failure modes on the environment, and statistical analyses have determined the actions most likely to reduce the effects of pollution on the ecological systems of the world. Through a balancing of wealth, the have nations underwrite the have-nots to prevent disruption of the ecological balance. Quality methods and techniques are built into local economies to plan win-win management of the global economic marketplace. Global economic councils focus on the well-being of the global community rather than just a community of individual nations, each seeking its own advantage. In this environment technology is brought to bear against the problems that most affect mankind as a whole, rather than merely for economic return.

- Globalization—The world has awakened in time to realize that a common problem is attacking all of mankind—environmental degradation is racing



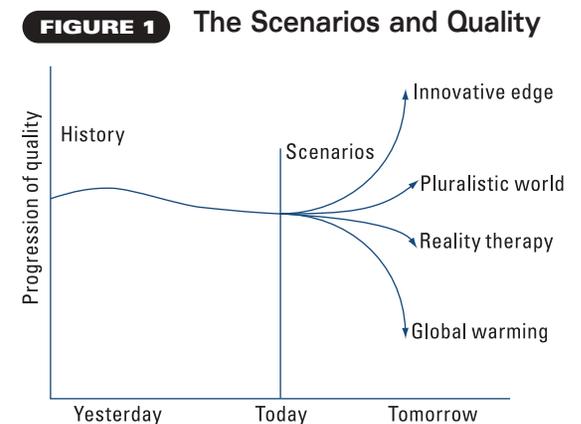
ahead at a nonlinear function and correcting this problem is the force that unites the efforts of all people on the Earth.

- Innovation/Creativity/Change—Mankind has learned that to have effective solutions to its problems it must engage all communities in the dialogue that leads to both mutual respect and shared vision about the strategic direction. Innovation and creativity are methods that harness the inventive power of people to design new options that define the best opportunities for resolving problems or establishing advanced capabilities.
- Outsourcing—Business leaders have recognized that outsourcing is an intermediate step in transition toward global business. Business leaders learned that establishment of a full business capability engages local organizations as full partners in their global operations. Outsourcing is no longer a strategy for acquiring cheap labor; it is now a strategy to penetrate foreign markets and to develop underperforming national economies.
- Consumer Sophistication—Customers have become exceptionally sophisticated in the way they define their requirements and highly particular in their expectations for the consistent performance to these requirements. Customers seek customized solutions that preserve their uniqueness and assure that they are able to operate with freedom as they require getting their business job done the way they want to do it.
- Value Creation—If processes do not create value for customers, then they must be either minimized or eliminated. There is no option to this lean

business imperative. Value must be defined from the customer's perspective and measured in financial terms in order for it to be meaningful.

- Changes in Quality—Quality has become a holistic measure of system performance that deals with all dimensions of cost, time, and performance to requirements.

Figure 1 depicts the potential progression of quality within each scenario.



Implications

What It Means To Be “In the Chase”

The scenarios served as narratives to help people imagine what the world might be like in the future, thus setting up the third phase of the study. In this most important step, ASQ shared the outcomes of the first two steps with leading thinkers and experts in quality, plus the board of directors and staff managers (see the Acknowledgments page for a complete list of contributors and commentators). The invitation was to envision the implications of the key forces and scenarios for:

- Organizations and the quality field.
- Quality professionals (especially from a career perspective).
- ASQ.

12

The list of implications identified filled 11 pages, but several themes emerged in each of the three areas.

For organizations and the quality field. To succeed in the future, organizations need to move toward:

- A systems, rather than process, approach to quality. This will be the only way to handle the increasing complexity of business and the world. “The global market creates a system of systems that are developed and manufactured in various countries and companies,” said Chava Scher, corporate director for quality for Rafael Ltd. in Haifa, Israel. “This requires defining a holistic approach to quality and how to manage it.”
- Speed—getting to market faster, adapting more readily, moving more quickly in general. “Organizations need to be able to develop and launch new products and services faster, staying ahead of the maturity curve,” said Duke Okes, a quality consultant and ASQ Fellow.
- Anticipation is an emerging premium closely related to speed, because the first—to market, to change, to plan—wins. According to Armand V. Feigenbaum, CEO of General Systems Co. and an ASQ Honorary member and quality pioneer, the need for speed and anticipation encompasses the increasing aggressiveness and volume of global competition, the “rapidity of up and down business cycles and fluctuations throughout both national and international markets, and the speed of changes in manufacturing, product development, and marketing.”

- Integration of management systems. “Quality, environmental, safety, and health are all coming together, along with finance and security,” said Dennis Arter, an auditing expert, author, and ASQ Fellow. “Our profession is no longer focused only on quality. We use Six Sigma tools for Sarbanes-Oxley, sales and supply chain management.” Other experts added social responsibility to this management system mix.
- Change and transformation—breakthroughs as opposed to quality control and incremental improvement. “Our role is changing dramatically,” Arter said. “We have completed the transition from quality control to assurance to management. I believe the next era will be quality of design. Our profession will transform into risk management: of quality, pollution, accidents, break-ins, and market failures.”
- Making the world sustainable and having organizations take responsibility for it. “The United States has only slightly begun to consider the problems we’re creating with depletion of resources and dealing with wastes,” Okes said. “As China and India further industrialize, the air and water will increasingly be filled with pollution.”

Scher added: “Reducing waste is a never ending war that demands new and innovative ways and tools.”

- Strategic, not just tactical, quality. This will become the quality of business. “Strategic quality will allow the quality function to maintain a distinct value proposition,” noted Bill Schiemann, CEO of the Metrus Group.

Eduardo Guaragna, strategic planning director of Programa Gaucho da Qualidade e Produtividade (Regional Program of Quality and Productivity), the national quality organization of Brazil, took it a step further. “Quality is a minimum reference and standard. The name for quality in business must be changed to an excellence model. And the quality role must be clear in its strategic intents.”

For quality professionals. According to the Futures Study, profound change lies ahead for people who work in quality:

- The future is bright—if the profession learns and responds to change. “I see nothing but blue skies for the quality professional,” said Grace Duffy, a quality consultant and ASQ Fellow and board member. “There is enough work out there for all of us. It takes personal initiative to seek the skills and abilities associated with the career path we prefer.”
- Quality professionals must learn the language of business and strategic quality. “Only those who communicate with senior leadership will be able to advance the quality level to one that is more sophisticated than the level in place,” noted Ken Case, an ASQ past president and retired industrial engineering professor.

“The ability to be a business partner vs. quality cop will be essential,” added Michael G. Beatrice, VP of corporate regulatory and quality science at Abbott Laboratories.

“Quality will become the standard for worldwide business, not because of external regulations but because of people who truly care and desperately want to provide the highest quality in whatever they do,” said Sister Mary Jean Ryan, president and CEO

of SSM Health Care. “The global community will be further connected by a commitment to standards of exceptional performance and service.”

- To succeed in the new world order, quality professionals must add skills in several areas: people, anticipation, change, innovation, and systems. “The development of quality leaders should include development of critical thinking skills, strategic thinking, open mindedness, predictive modeling, and value creation analysis,” said Cecilia Kimberlin, VP of quality, regulatory and compliance for the medical products group of Abbott.

“The pace of change now requires much more creative thinking, which is an opportunity for quality practitioners,” added Paul O’Grady, managing director of Excellence Ireland Quality Association.

Quality professionals also need to add new languages and cultural knowledge to their repertoires. “They have to know how to act in different markets, cultures, and countries,” said Salvador Olivas, director general of AEC, the Spanish Association for Quality.

- Design and enterprise quality must become a critical part of the professional’s body of knowledge. “Designing quality into our products at the development stage will be a competitive edge,” Beatrice said.

TABLE 1 Forces of Change From All ASQ Futures Studies

1996	1999	2002	2005
Changing values	Partnering	Quality must deliver bottom-line results.	Globalization
Globalization	Learning systems	Management systems will increasingly absorb the quality function.	Innovation/creativity/change
Information revolution	Adaptability and speed of change	Quality will be every-one’s job.	Outsourcing
Velocity of change	Environmental sustainability	The economic case for the broader application of quality will need to be proven.	Consumer sophistication
Increased customer focus	Globalization	Global demand for products and services will create a global work force.	Value creation
Leadership	Knowledge focus	Confidence in business leaders and organizations will decline.	Changes in quality
Quality in new areas	Customization and differentiation	Customer expectations will continue to rise.	
Change in quality itself	Shifting demographics		



About enterprise quality, Case noted: "Quality is a non-linear affecter of performance. It is most effectively and efficiently used at the enterprise level to provide overall optimized value to a broad range of stakeholders."

- Basics first: While quality professionals have to develop and apply many new skills, the need to use and teach basic quality tools will not go away. "The opportunity to get the fundamentals down is much greater than trying to deal with quality issues at an exotic level," said Scott Dalglish, CEO of Dragonfly Innovation Kits and columnist for *Quality Magazine*. "The change that needs to happen in quality is to demonstrate the value in this approach and promote and train in the basics."

Schiemann also emphasized the importance of quality professionals educating others: "Quality skills will be needed, assumed as basic, but this will place a demand on training and certification of those capable of coaching, consulting, and delivering quality."

For ASQ. The implications of the forces and scenarios for ASQ are interdependent on the ones for organizations and quality professionals. The Society needs to help the profession develop all the skills and competencies outlined above and, thus, help it grow in value. Study participants also saw a need for ASQ to influence and lead the way for the quality community.

Several groups already have been replicating parts of this Futures Study experience in their own environments. Asociación Española para la Calidad held a World Café session in Madrid in October 2005, and participants from Fundece, Ipace, and the Argentine National Quality Award Foundation engaged in a World Café in Buenos Aires in November.



Synthesis

“As a futurist, systems thinker, and social scientist, what I focus on when looking for patterns and trends in qualitative futures data such as these four ASQ futures studies are:

1. The forces that continue to surface as the key drivers of the future, throughout this time frame, not just in a single study (allowing for differences in wording and level of specificity). But like anything else, these forces are also subject to change during this time period, so I also look for how the forces have evolved during this period.
2. Significant new forces that have emerged as the current drivers of the future.
3. The whole system—Are there any patterns or trends evident in the composite view of all the key forces of change?

You know the old saying, ‘The more things change, the more they stay the same.’ That’s the first thing that strikes me when viewing the forces of change identified in these four ASQ Futures Studies. Despite all the change that has taken place in the world during the decade covered by these studies, despite that change itself is one of the major forces identified in three of the four studies, and despite that these studies were conducted with four different Delphi groups, the forces of change impacting ASQ and quality at the beginning of this decade are remarkably similar to the forces of change impacting them at the end of it. But of course, these forces have been changing along with the rest of the world.



From a whole system perspective, I see no dramatically new or different forces of change emerging over this time period. Instead, I see the same fundamental set of forces being re-grouped into a more interrelated systems view of the future, where the forces are more macro forces that embody a number of the more micro forces that surfaced during previous studies. For example, four of the key forces from the 2002 study are embodied within the 'Value Creation' and 'Changes in Quality' 2005 forces. And the relationships between these 2005 forces are more clear, such as how increasing consumer sophistication drives the need for greater value creation

which drives changes in quality. This systems view of the future enables the use of practical tools to help translate this data into actionable strategies, such as by looking at the cause/effect (or 'X/Y') relationships between these forces to help determine where to implement strategies that will have the greatest positive impact on the whole system or by using scenarios to dialogue around what you would do if certain conditions or events occurred concerning one or a combination of these forces."

—Arian Ward, CEO & Principal Coach/Consultant, Community Frontiers

Questions to Help You Break Away From the Pack

FOR ORGANIZATIONS AND INDIVIDUALS ALIKE, FOLLOWING ARE SOME QUESTIONS TO SPARK SOME INTROSPECTION AND DISCOVERY AS THEY CONSIDER IMPLICATIONS OF THE FUTURES STUDY FOR THEMSELVES.

Am I thinking strategically about the advancement of my career as a quality professional during the next five years as these forces begin to play out? Ten years? How can the learnings from this Futures Study and the insights of its many contributors help me shape that personal strategy? And how about for my organization?

Do I have the necessary resources to prepare me to compete in the future? In what ways can this Futures Study help me determine what those necessary resources might be? Skillsets? Mindsets? Technologies? Team support?

How can I as an individual quality professional turn the challenges identified in this Futures Study into opportunities? How can my quality community/communities help in this regard?



Envisioning myself as a competitor in a race, how would I modify my personal or organizational strategy—what adaptations might I put in place to ensure I stay in the chase—if I saw conditions in my environment approximating those described in one or more of these scenarios?

What significant milestones can I identify to let me gauge if I'm maintaining my pace toward reaching my strategic objectives/goals?

Am I part of a strong quality community that I can turn to for dialogue around what to do if certain conditions or events occurred concerning one or a combination of these forces? If not, whom can I turn to, or how can I begin to build that community?

Acknowledgments

THANKS TO THE MANY INDIVIDUALS FROM AROUND THE WORLD WHO HAVE CONTRIBUTED THEIR BEST THINKING TO BRING CLARITY AND MEANING TO THIS ASQ FUTURES STUDY.

STEVE ALLEN, TEXAS INSTRUMENTS • DENNIS ARTER, COLUMBIA AUDIT • RON ATKINSON, SAIC-GM-WULING AUTOMOBILE CO., LTD. • ASBJORN AUNE • BARBARA BANEK, ISPAT INLAND RESEARCH LABS • CHRISTOPHER BAUMAN, AMERICAN SOCIETY FOR QUALITY • MICHAEL BEATRICE, ABBOTT LABORATORIES • MARCOS E.J. BERTIN, INTERNATIONAL ACADEMY FOR QUALITY • EDGAR BERTSCHINGER, PGQP • CHARLES BIGI • MAUREEN BISOGNANO, INSTITUTE FOR HEALTHCARE IMPROVEMENT • PAUL BORAWSKI, AMERICAN SOCIETY FOR QUALITY • KENNETH E. CASE, OKLAHOMA STATE UNIVERSITY • MARIO CASELLINI, FUNDECE-IPACE • ALAIN CHAUVEL, BUREAU VERITAS • MARY COLLARD, THE CHIMES • TERRY COLLARD, THE CHIMES • GILBERTO CONCEPCION, JGC & ASSOCIATES • LINDA S. COOK, EMS TECHNOLOGIES, INC. • JENS DAHLGAARD, LINKOPING UNIVERSITY • SCOTT DALGLEISH, SPECTRA LOGIC • H. WILLIAM DETTMER, GOAL SYSTEMS INTERNATIONAL • GRACE DUFFY, MANAGEMENT AND PERFORMANCE SYSTEMS • DANNY DUHAN, NORTHROP GRUMMAN • GEORGE S. EASTON, GOIZUETA BUSINESS SCHOOL • JERRY FAUST, TIME INC. • CONNIE FAYLOR, BEN FRANKLIN TECHNOLOGY PARTNERS • ARMAND FEIGENBAUM, GENERAL SYSTEMS CO., INC. • RANDY FLEMING, EFW INC. • MARIO GIBERTONI, STUDIO BASE SRL • JOHN GRANT, FERMILAB • EDUARDO GUARAGNA, COPESUL • SHYAM K. GUJADHUR, INTERNATIONAL TRADE CENTRE • HARRY GUTHRIE • H. JAMES HARRINGTON, HARRINGTON INSTITUTE • ABDELATIF HEGAZY, TECOM INVESTMENTS\DUBAI HOLDING • VINCENT HENG, HOUSING & DEVELOPMENT BOARD, SINGAPORE • HARRY HERTZ, BNQP-NIST • SPENCER HUTCHENS JR. • WOLFGANG M. KAERKES, GERMAN SOCIETY FOR QUALITY • HITOSHI KAMIKUBO • NORIAKI KANO, TOKYO UNIVERSITY OF SCIENCE • EERO KARJALAINEN, QUALITY KNOWHOW KARJALAINEN OY • ELIZABETH KEIM, INTEGRATED QUALITY RESOURCES, LLC • CECILIA KIMBERLIN, ABBOTT LABORATORIES • ROBERT E. KING, GOAL/QPC • YOSHIO KONDO, KYOTO UNIVERSITY • KOZO KOURA, KOZO KOURA AND ASSOCIATES • IVETA KOZLICKOVA, NORTHWEST AIRLINES, INC. • MARTIN LAMPNER, THE CHIMES • RHONDA LANG NETZEL, AMERICAN SOCIETY FOR QUALITY • BRIAN LEHOULLIER, AMERICAN SOCIETY FOR QUALITY • ALFONSO G. LOPES, PETROBRAS • DAVID B. LUTHER, LUTHER QUALITY ASSOCIATES • PAUL MALEK, AMERICAN SOCIETY FOR QUALITY • LAURA MCDONALD, TICONA • PAL MOLNAR, HNC FOR EOQ • LAUREL NELSON-ROWE, AMERICAN SOCIETY FOR QUALITY • PAUL O'GRADY, EXCELLENCE IRELAND QUALITY ASSOCIATION • DUKE OKES • SALVADOR OLIVAS, ASOCIACIÓN ESPAÑOLA PARA LA CALIDAD • DEBBIE PHILLIPS-DONALDSON, AMERICAN SOCIETY FOR QUALITY • THOMAS PYZDEK, PYZDEK CONSULTING INC. • ADELMAN RIBEIRO, PETROBRAS • KARLA RIESINGER, AMERICAN SOCIETY FOR QUALITY • NICHOLAS C. ROMANO JR., SPEARS SCHOOL OF BUSINESS • PAUL ROSSLER, OKLAHOMA STATE UNIVERSITY • MARY JEAN RYAN, SSM HEALTH CARE • CAROL SAGER, SAGER EDUCATIONAL ENTERPRISES • BOB SCANLON • CHAVA SCHER, ISQ • BILL SCHIEMANN, METRUS GROUP • HERBERT SCHNAUBER, DGQ • HANS DIETER SEGHEZZI • DANIEL G. SHIBLEY SR., BAZZ AND HOUSTON • MADHAV SINHA, MANITOBA DEPARTMENT OF LABOUR • LARRY SMITH, JURAN INSTITUTE • HUGO RICARDO STRACHAN, STRACHAN MANAGEMENT • KENNETH STEPHENS, KING'S POINT • WILLIAM STERETT, PREMIER PERFORMANCE NETWORK • BRANCH STERNAL, TRIULANT FEDERAL CREDIT UNION • GREGORY TONER, RECKITT BENCKISER • ARIAN WARD, COMMUNITY FRONTIERS • GREGORY WATSON, BUSINESS SYSTEMS SOLUTIONS, INC. • JACK WEST • SUSAN WILLIAMS, FIRST DATABANK • CONNIE WILSON, SCHWEITZER ENG LAB • STEVE WNUK, AMERICAN SOCIETY FOR QUALITY • TARA WREN, FIRST DATABANK • MOHAMED ZAIRI, UNIVERSITY OF BRADFORD SCHOOL OF MGMT.



The 21st century will be the century of quality.

— J.M. Juran



ASQ

AMERICAN SOCIETY
FOR QUALITY

600 N. Plankinton Ave.
Milwaukee, WI 53201-3005
t: 414-272-8575
800-248-1946
f: 414-272-1734
www.asq.org

Copyright © 2006 American Society for Quality

Item B1192

YOUDEN ADDRESS

The Future of Quality Technology: From a Manufacturing to a Knowledge Economy & From Defects to Innovations

Søren Bisgaard

University of Massachusetts–
Amherst and Institute for
Business and Industrial Statistics,
University of Amsterdam

BIOGRAPHY Dr. Søren Bisgaard (1951–2009) was an international expert on quality improvement. He was the Eugene M. Isenberg Professor of Technology Management at University of Massachusetts Amherst and Professor of Business and Industrial Statistics at University of Amsterdam. Originally trained as a machinist/toolmaker, he held degrees in industrial and manufacturing engineering from Denmark and MS and Ph.D. degrees in statistics from University of Wisconsin–Madison. Dr. Bisgaard worked as a full time management consultant, held previous positions as Professor and a Director in the Institute for Technology Management at University of St. Gallen, Switzerland, and as Professor of Industrial Engineering and Director of the Center for Quality and Productivity Improvement at University–Madison. Soren was a Fellow of the American Society for Quality (ASQ) and the American Statistical Association, an Academician of the International Academy for Quality, and the author of more than 100 publications. He received numerous awards in his lifetime including the Shewhart Medal (2002), the William G. Hunter Award (2002), the Ellis R. Ott Award (1990), the Wilcoxon Prize (1998), the Shewell Award (1981, 1987, 1995), the Brumbaugh Award (1988, 1996, 2008), the Cecil C. Craig Award (2006) and the George Box Award (2004). He served on the editorial board of *Journal of Quality Technology*, *Quality Engineering*, the management board of *Technometrics*, and on the Publications Management Board of the American Society for Quality. Dr. Bisgaard was a beloved and highly respected member of the quality community. His absence is felt by all who knew him and his work.

INTRODUCTION

Quality technology is at a crossroad! Quality and technologies applied to improve and control quality and especially statistics are, of course, as important as ever. But the world around us is changing exceedingly fast and we will need to rethink and refocus our efforts. Figure 1 illustrates the change in employment in manufacturing over the past 25 years in the world's major economies. In 1970, roughly 25% of the workforce in the United States was employed in manufacturing. Today, fewer than 10% of American workers

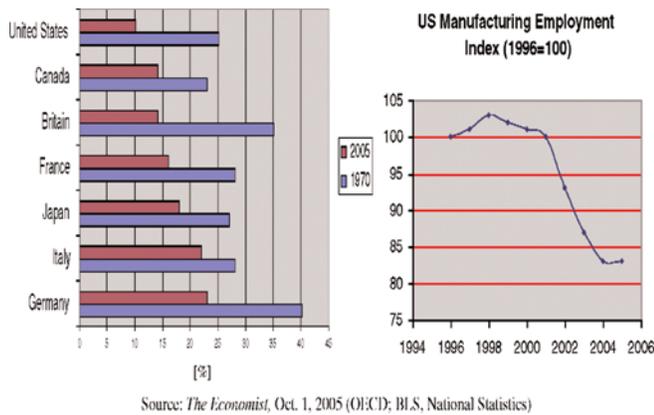


FIGURE 1 Manufacturing as % of total employment: comparing 1970 with 2005. (Color figure available online.)

are employed in manufacturing. Indeed, manufacturing output as a percentage of GDP (measured in current prices) has declined from 26% in 1970 to 13% in 2005 (Bharati 2003). Moreover, manufacturing in 1970 was largely physical and manual in nature, whereas today about 50% of the current 10% “manufacturing” employment could just as well be classified as service or “knowledge work,” as the late Peter Drucker called it. Those trends are mirrored in all of the major economies of Europe and Japan. *Yet the quality profession is still primarily focused on manufacturing!*

A major factor behind these trends is the extraordinary growth of the Chinese economy. Another is the outsourcing of jobs to low-cost Asian nations. Without a doubt, this has caused dislocations and hardship for many. But it is not all gloom and doom. It is important to recall that in 1820, agriculture employed 70% of the U.S. labor force; now it is about 2%. But the agricultural output by U.S. farmers is today larger than ever before. The issue is therefore not where people work but whether they create wealth. Prosperity depends not on labels but on our ability to innovate, produce high-value-added products and services and adjust to new circumstances. Economic growth relies on our ability to adapt and shift resources to where they have the most efficient use!

The quality profession needs to adapt to these new realities! Currently quality technology is primarily geared toward assisting a manufacturing-based economy. But we are now in a *knowledge economy!* The good news is that quality technology essentially consists of knowledge generation tools. So with minor adjustments to our focus, we should be in an

excellent position to be at the vanguard—the quintessential knowledge workers. In this article, I provide some thoughts about the future of quality technology and where I think we need to focus our efforts, our professional and educational activities, and our journals.

AN ECONOMIC PERSPECTIVE ON QUALITY

To understand the importance of quality technology in society, I believe that we need to adopt an economic perspective. Focusing on tools, as we often do, or defining quality as “variance reduction” as implied by Six Sigma is too narrow. We work on quality, not because it is “good” in some metaphysical sense but because it is a means to an economic end.

In a free market economy, reality is distinguished by competition from new commodities, new technologies, new sources of supply, new types of organization—competition that commands a decisive cost or quality advantage. According to the economist Schumpeter (1950) this kind of innovation-based competition strikes not on the margins of existing firms but at their very foundations and threatens their survival. Innovation-based competition is extremely effective. The epic struggle between the incumbent IBM and Microsoft, the nascent startup, during the 1980s provides an illustrative example.

Whereas standard equilibrium economic theory fails to provide a satisfactory explanation for economic growth, entrepreneurial innovation provides a compelling explanation for endogenous growth. Innovation defined not just as invention but as the complete process of development and eventual commercialization of new products and services, new methods of production or provision, new methods of transportation or service delivery, new business models, new markets, and new forms of organization is the fundamental impulse that sets and keeps the economic engine in motion. Without innovation, firms will stagnate and wither away. Indeed, the primary reason for profits is as a premium for the risk of innovation. Innovation introduces a dynamic element to the economic system that creates change. Typically, new and useful innovations initially generate high profits for the successful entrepreneur. But the high initial profit attracts other entrepreneurs and investments. Consequently,

the volume starts to increase, and with these adjustments to the supply prices gradually fall and the competition gets tougher. Over time the price of products naturally converges to a level where there is hardly any profit left. Eventually, the weaker competitors and those that do not innovate are acquired, merged, or go out of business. Sometime during such a cycle, a new innovation typically enters the stage and a new cycle is initiated. Eventually this new innovation renders the older innovation obsolete. Schumpeter (1950, p. 83) referred to this as “the perennial gale of creative destruction.” For example, the typewriter was rendered obsolete by the computer, and lately the computer industry itself has been under much pressure, resulting in major consolidations, mergers, and acquisitions, and much of the production has moved offshore. This convergence toward commoditization is as close as it comes to an “economic law” and is the reason for the current trend toward outsourcing to countries with lower labor cost levels.

So what does this have to do with quality? First, let me define quality like Juran (1989) as “fitness for use” with the two subsidiary definitions of *deficiencies* and *features*. Deficiencies cost money to produce, sometimes much more than doing things right. Any improvements aimed at eliminating chronic sources of defects from processes are process innovations that reduce cost and improve our competitive position (see Bisgaard and Freiesleben 2004). When a firm has developed a reputation for defect-free delivery of high-quality products, it has achieved a competitive edge that is hard to match. Indeed, this type of “non-price competition” is much more effective than competing on price—getting into price wars that invariably ends up with a race to the bottom. But, of course, we cannot only rely on reducing deficiencies. We must also compete on product innovations that involve new features and develop new products or services that provide better value to the customers. This is what Juran (1989) called quality planning and in Six Sigma terminology is called Design for Six Sigma (DFSS). Thus, I will argue that quality technology, in particular Six Sigma, in this broader economic perspective really is a systematic approach to process and product innovation.

In the innovation literature it is often popular to distinguish between breakthrough innovations and

incremental innovations. A breakthrough innovation would be something like Bell Labs’ invention of the transistor. An incremental innovation would be like Intel developing a larger, faster chip. Many people, especially some high priests of business management, like to look down on incremental innovations and claim that breakthrough innovations are the most (only) important issue. Wise people who study business history, however, know that focusing only on accomplishing breakthrough innovations is a recipe for losing your shirt. RCA laboratories invented the liquid crystal display (LCD) panels that today are killing the cathode ray tube (CRT) business. But the high profits are going not to RCA but to the companies that continued to incrementally innovate the product and the associated processes such as Samsung. So, of course, the proper way to look at this is that we need to be good at both breakthrough and incremental innovation. Not either/or but both! And this is where the quality profession comes in. Much of what quality technology is applied to can broadly be characterized as incremental innovation. Increasing the yield of a process by reducing the defects or achieving better control of a process are typical examples of incremental innovations. However, for those who may turn their noses up on that type of work, one should always remember that innovations that may not be technologically significant enough to warrant much attention in technical journals may indeed be extremely important economically. Making the first lightbulb was a technological breakthrough. Making and fine-tuning (with design of experiments and statistical process control) a machine that can produce 3,000 lightbulbs an hour is not.

Innovation is much discussed in the business literature these days and has lately been the focus of policy makers in Washington, D.C. For example, the U.S. Council on Competitiveness published a report entitled *Innovate America* in December 2004. In this report they stated that:

- Resolved: Innovation will be the single most important factor in determining America’s success through the 21st century.
- America’s Challenge: America’s challenge is to unleash its innovative capacity to drive productivity, standard of living and leadership in global markets.

- America's Task: For the past 25 years, we have optimized our organizations for efficiency and quality. Over the next quarter century, we must optimize our entire society for innovation.

This is, of course, all well and good. However, on page 16 the authors of the report state that “The manufacturing strategies introduced over the past two decades of lean, Six Sigma-esque continuous productivity and quality improvement are no longer a source of meaningful competitive advantage.” As indicated above, we need both breakthrough and incremental innovations. So this is quite misguided. Typically when a new product is introduced it is expensive and often not all that high quality (both in the terms of deficiencies and in features). Again, LCDs are a good example; only lately has the LCD picture quality caught up with that of CRTs while the price has come down to competitive levels. Contrary to the Council's pontification, several of the companies involved in developing LCDs to these higher levels of quality and low cost, in particular Samsung, have certainly found that Six Sigma provided them a very meaningful source of competitive advantage! However, this perception about the role of quality technology among academics and policymakers in Washington could be a problem for our profession. It is our problem and not the policymakers to make sure they understand that quality is indeed about innovation and needed as much as ever before.

For this and other reasons, I think it would be wise if we referred to quality as a part of the general concept of innovation. Indeed, I will claim that quality technology and statistics are the knowledge economy's key tools for systematic innovation. When I look at some of the Six Sigma projects I have been involved with in the past few years, it has increasingly struck me as unproductive to describe them as “quality improvement.” To give a few examples, I have worked on reducing takt time in a plasma deposition process, optimizing the performance of LCD screens, extending the life of lightbulbs, improving sales forecasting, reorganizing an inventory management system, and reducing the time of hospital stays. None of these project involved defects in the traditional sense. It therefore seems contrived to call such efforts “quality.” What we did was to *create better value for customers*. The projects are more appropriately called innovation projects. In

fact, Six Sigma, with its tools, roadmaps, and management processes, essentially is a process for systematically selecting, scheduling, and carrying out innovation projects.

Another reason for calling what we do innovation is that quality in most CEOs' perceptions is an irritant and certainly a nonstrategic issue—mostly something they would rather see go away and like to delegate. In other words, quality and defects has a negative connotation. Innovation, on the other hand, is about new and better things—is optimistic, is part of the future, has a positive economic connotation, is a strategic issue—something executives like to be involved in! Semantics and perceptions do matter!

IMPLICATIONS FOR QUALITY TECHNOLOGY: APPLICATION AREAS

As mentioned above, the quality profession is still primarily focusing on catering to the traditional manufacturing environment despite the fact that we are now overwhelmingly in a knowledge economy where innovation and especially innovations in service and the development of new products with high intellectual content are the economic drivers. This has a number of implications for our tools and the application areas. In this and the following section I will discuss both.

First, let me state that I believe that the quality profession's core mission will remain for us to act as the primary purveyors of the technology and management systems for knowledge generation based on data; that is, scientific method for innovation. Further, our core competencies are in process and product innovation and problem solving through learning from data and experiments. Further, we are the purveyors of knowledge about organizing systematic innovation. The application areas and the specific tools may change but are subsidiary to these core competencies.

The new application areas and new opportunities as I see them are primarily service—both high and low tech, health care, government, public sector, and nonprofits. Another is new product design followed up by rapid cycles of improvements, product validation, and reliability. Finally, homeland security and process and systems monitoring in general are significant growth areas. Space will not permit me to deal with all of these areas in detail, so let me only elaborate on a few.

Almost all services, even the most mundane, apply computers for scheduling, accounting and other administrative tasks. The data thus generated can be mined with statistical tools for useful information about how these services can be improved, controlled, and differentiated to provide better value for the customers.

Health care is already beginning to apply Six Sigma; see, for example, van den Heuvel et al. (2005). To stem the spiraling cost of health care, it will be necessary that such initiatives become more widespread. Woodall (2006) also provides a mind-expanding overview of how quality control tools are being used in health care and public health.

Another related area is the medical device business. The tolerance for defects, product failures, calibration, and reliability problems is exceedingly low. Medical device safety is an escalating concern with the quality problems with Guidant's implanted heart defibrillators and the Swiss firm Sulzer's disastrous hip implant scandal topping the news. The Federal Drug Administration (FDA), which regulates such matters, is keenly involved with quality- and reliability-related issues. The Institute for Validation Technology (IVT) provides many functions that parallel those of American Society for Quality (ASQ) but perhaps without the full benefit of our knowledge and experience accumulated from more than 50 years of work on similar problems in the traditional manufacturing and aerospace industries. It would be important and rewarding for the quality profession to be more actively involved in making this industry safer. Design of experiments, reliability engineering, and quality control methods could make a real difference. Many of these devices collect data that with clever use of statistical process control (SPC) algorithms and other statistical tools could help the users monitor their own health. Unlike pharmaceutical products, this industry thrives on incremental design innovations. This high-value-added industry has the potential of making a significant economic impact, hopefully replacing many of the traditional manufacturing jobs that have been outsourced, downsized, offshored, or eliminated.

We usually think of SPC as useful for the control of manufacturing processes, but we should really think of it more broadly as systems monitoring and control, where the system could be almost anything. For example, modern automobiles are, for

environmental protection reasons, required by law to be equipped with an onboard diagnostics (OBD) computer to monitor a large array of power train variables. Most of these algorithms are based on modern quality control principles; see Box et al. (2004). Indeed, unknown to most, the car industry is easily the largest user of SPC techniques today, not for manufacturing purposes but as an integral part of the engine design. Every American car that comes off the assembly lines is checked with more than 100 exponentially weighted moving average (EWMA) algorithms in parallel, all sending signals to a single "check engine light" (malfunction indicator). A key issue in this application is to reduce the false alarm rate while making the OBD sufficiently responsive to provide a valid alarm. These same concepts and methods apply to monitoring systems from medical devices to nuclear power plants.

The elaborate systems that presently are being developed for homeland security are conceptually similar to a quality control system for a manufacturing process. As in the automotive application, a high false alarm rate will have significant and devastating impact on the overall effectiveness of the system. The vast amount of data generated by such systems could be used to improve these systems. Woodall's (2006) discussion of control chart used for monitoring infectious diseases, especially on the backdrop of the recent fear of pandemic flu, is another important emerging application that the quality profession should pay attention to as the relevance of traditional manufacturing applications is waning.

Taking this a step further—perhaps going out on a limb—one could imagine that nuclear power generation, an increasingly appealing alternative to fossil fuel from environmental and international security points of view, could be reconsidered as a viable source of energy if we could only make it safer. When its popularity waned in the 1980s it was based on 1960s technology. However, taking into account the past 30–40 years of technological innovations in materials and nuclear engineering combined with innovations in computer technology, software, and sophisticated multivariate statistical process control technology to make it safer, nuclear power could have the very real advantage of freeing us from the dangerous and destabilizing dependence of oil from the Middle East.

Finally, despite my claim that manufacturing is moving offshore, some manufacturing will, of course, remain in the United States. The manufacturing that will stay will incorporate a high content of knowledge. Biopharmaceuticals are an especially interesting application area for advanced quality technology. Because of the biological base, such processes exhibit large variability and are often extremely nonrobust. Design of experiments, response surface methods, evolutionary operations (see Box 1957), and multivariate process control will be indispensable tools for achieving high, reliable yields as well as maintaining high product safety standards.

IMPLICATIONS FOR QUALITY TECHNOLOGY: TOOLS AND METHODS

I will now turn to the implications of these trends for tools and methods. The new application areas of quality technology discussed above can obviously benefit from the use of existing quality technology and tools. However, it should be anticipated that these new application areas will also stimulate or require new developments with regards to tools and methods, see Box (1984) and Bisgaard (2005). But it is by no means only the application areas that will stimulate new trends and developments in quality technology. We used to think of quality technology as mostly statistical process control, design of experiments, and reliability. Today we should look at the entire statistical toolbox as quality technology. Perhaps the strongest driver for change is the confluence of computer hardware, software and the Internet. We are only beginning to see the consequences and new opportunities. Many sophisticated and “theoretically useful” tools and methods of statistics such as multivariate statistics may have been “on the books” since the 1930s but only now, in combination with powerful computers, user-friendly sophisticated software, computer graphics, sensor technology, and the easy electronic transfer and storage of massive data volumes have these tools become useful in reality. Again, because of space limitations I will only outline a few areas where I find the developments for quality technology particularly exciting.

Data are obviously the lifeblood of quality. Thus, the past few decades’ revolutionary innovations in

sensor technology will have a significant impact on our work. We are now able to measure a much larger variety of process parameters, with relatively cheap sensors, than ever before. We used to be confined to measuring temperatures, pressures, and flow rates. Now we are beginning to have sensors for almost anything; we even have electronic “noses” to monitor smells. Even more important, with traditional temperature, pressure and flow rate sensors we were mostly able to monitor homogeneous materials and liquids. Now, with digital cameras we can monitor virtually anything and in even the most hostile environments. In one application that I was involved, in the client wanted to monitor by sampling in real time the color and shape of a flame in a large industrial furnace. In another, the client wanted to periodically sample the conditions of a complex flue system, too hostile an environment for a human being to enter. Even more sophisticated applications of digital imagery and the use of principal components analysis for online quality control and grading of softwood lumber have been reported by Bharati and MacGregor (2003). These are developments that herald an existing and significant paradigm shift for quality improvement and control that the quality profession ought to pay keen attention to.

With new sensor technologies taking center stage, quality monitoring and control will move upstream and the focus will increasingly shift from monitoring output quality to monitoring and controlling inputs and process parameters. Moreover, the Shewhart \bar{X} -R sampling paradigm (subgrouping) will be taken over by real-time sampling, which favors statistical process control methods based on individual observations. The data will increasingly be multivariate and often autocorrelated because of the high sampling rates. These developments will necessitate the increased use of multivariate statistical techniques such as Hotelling’s T^2 principal components analysis, partial least squares, discriminant analysis, multivariate regression, factor analysis, canonical correlation, and multivariate time series analysis.

CONCLUSION

The field of quality and quality technology needs to adapt to a rapidly changing economic environment. We are in a global knowledge economy

dominated by services and high-knowledge-content products and processes. As in biological evolution, we may either adapt to new environmental conditions or risk extinction. If we choose to adapt and are visionary enough to see and exploit the new opportunities, I believe that the future is bright for the quality profession. In particular, I think we should expand our vision and reframe what we do as systematic innovation. For a further discussion, see Bisgaard and DeMast (2006). However, another reason for optimism about the future of quality technology is the aforementioned confluence of innovations in statistics, computer technology, software, graphics, the Internet, and sensor technology, including digital imaging and data storage technology. Only lately have these technologies been combined into a package that allows us to take advantage of them on a broad scale. These technologies have lately matured to a point where dramatically new possibilities have become viable and accessible and thus opened existing new opportunities for the quality profession and the application of quality technology. However, to be ready to take advantage of these opportunities we need to rethink our professional activities, our conferences, our educational materials, our textbooks, our role in the educational system in both engineering and business schools, and how we manage our journals. In other words, we need leadership around a new vision at all levels of our profession.

ACKNOWLEDGMENTS

The work on this article was supported by the Isenberg Program for Technology Management, Isenberg School of Management, University of Massachusetts, Amherst.

REFERENCES

- Bharati, M. H., MacGregor, J. F. (2003). Softwood lumber grading through on-line multivariate image analysis techniques. *Industrial & Engineering Chemistry Research*, 42:5345–5353.
- Bisgaard, S. (2005). Innovation, ENBIS and the importance of practice in the development of statistics. *Quality and Reliability International*, 21:429–438.
- Bisgaard, S., De Mast, J. (2006). After Six Sigma—What's next? *Quality Progress*, 39(1):30–36.
- Bisgaard, S., Freiesleben, J. (2004). "Six Sigma and the bottom line." *Quality Progress*, 37(9):57–62.
- Box, G. E. P. (1957). Evolutionary operation: A method for increasing industrial productivity. *Applied Statistics*, 6(2):81–101.
- Box, G. E. P. (1984). The importance of practice in the development of statistics. *Technometrics*, 26(1):1–8.
- Box, G., Bisgaard, S., Graves, S., Van Gilder, J., Marko, K., James, F. (2004). Performance evaluation of dynamic monitoring systems: The waterfall chart. *Quality Engineering*, 16(2):183–191.
- The Economist. (2005). Industrial metamorphosis. *The Economist* 377, October 1, pp. 69–70.
- Juran, J. M. (1989). *Juran and Leadership for Quality*. New York: The Free Press.
- Schumpeter, J. A. (1950). *Capitalism, Socialism and Democracy*, 3rd ed. New York: Harper & Row.
- van den Heuvel, J., Does, J. M. M., Bisgaard, S. (2005, February). Dutch hospital implements Six Sigma. *Six Sigma Forum Magazine*, 11–15.
- Woodall, W. (2006). The Use of control charts in health-care and public-health surveillance. *Journal of Quality Technology*, 38(2): 89–104.

No Boundaries

ASQ'S
FUTURE
OF QUALITY
STUDY





No one who's paying attention would argue that change is accelerating, and that our lives are punctuated by disruptive changes no one can anticipate. In the United States, the impact of subprime mortgages comes to mind. The global reach of the subprime mortgage mess illustrates for all to see just how far the notion of globalization has progressed. News of natural disasters travels at light speed across the globe, and within minutes we are viewing the

a future of constrained resources, where waste is no longer tolerable, quality knows how to eliminate waste. Those who master the systems of an enterprise may hold the keys to mastering the systems of a globe. Those who understand how to delve into data for meaning in their organizations may well delve into the data of world issues and unlock the meaning. Those who bring people together to solve problems may tackle problems beyond company boundaries.

The old boundaries have been obliterated.

2

devastation. Global warming, energy issues, and rising food costs unite all of us in ways no one would have thought of 50 years ago.

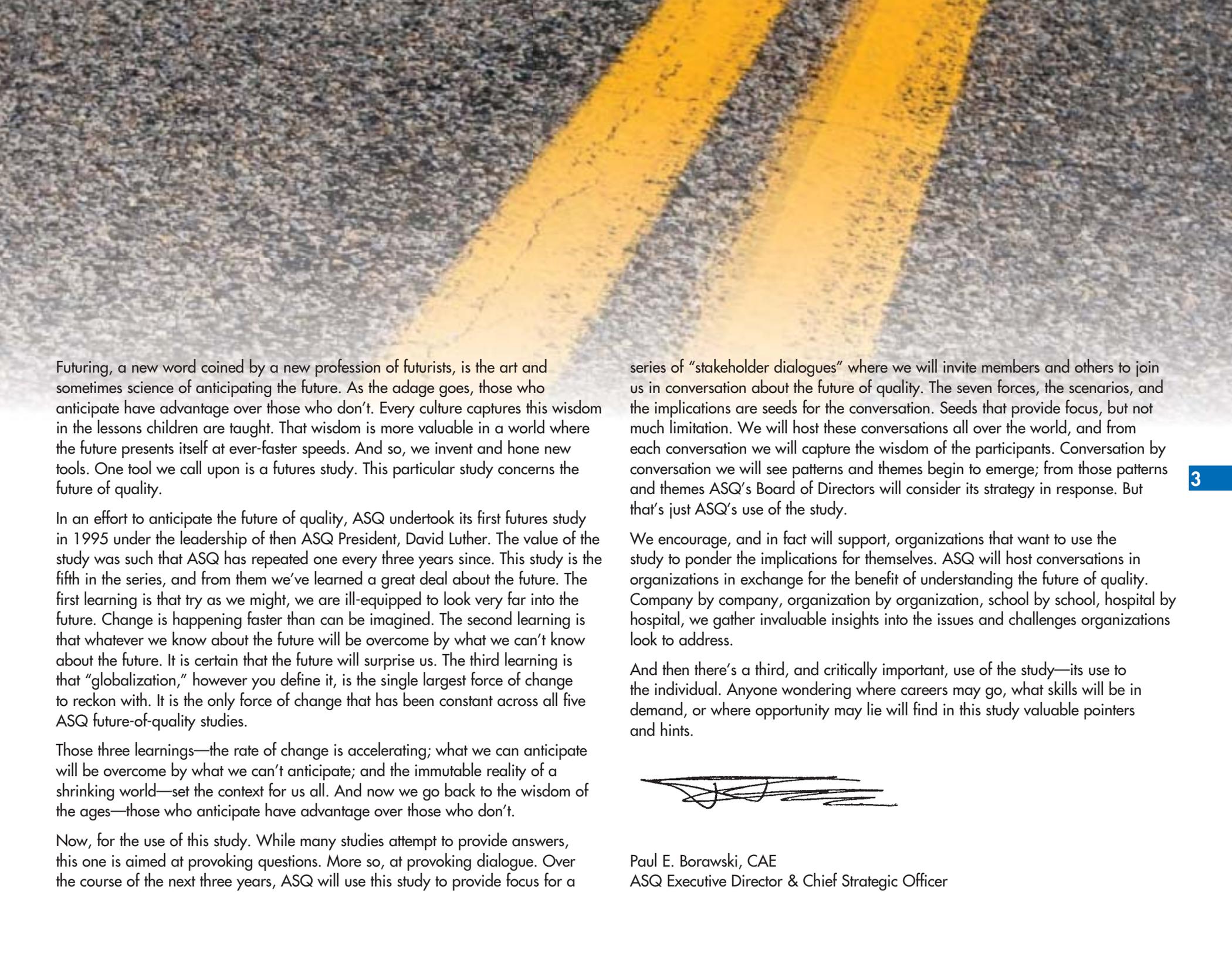
Those who know and work to master the concepts, techniques, and tools of quality know that quality can, and sometimes does, make a difference. And that knowledge takes two paths. One path is the journey traveled by the organizations we work for. The journey to compete, to win in the marketplace, to grow revenue and profit. To meet demanding customer expectations. To be world-class or risk extinction. And, with rates of discovery and innovation that ply against ever-shorter product life cycles. Today's victors reap staggering global rewards. The other path, outside our organizations, leads to the larger issues our world faces. Issues that confront us daily with increased urgency.

Increasingly the two paths cross. Work and the world. The world and work. In the issues that confront the world, there are opportunities for organizations. In

And even the definition of a company is changing. Once national, then multinational, now global. With each organizational evolution comes evolution of management, problem solving, and leadership. Global management, global problem solving, and global leadership.

Amidst the change, the complexity, and the urgent challenges there is much to be hopeful for and, if we allow ourselves, even to get excited about. The future is coming, of that we can be certain. A future of new technologies, new consumers, and new challenges to conquer. A boundaryless future of limitless possibilities, unencumbered by familiar conventions and rules of thumb, but accompanied by no small degree of risk.

We have two choices, the first to be swept away by the sea of change coming our way, the second to navigate that sea to our advantage. To navigate seas we've never traveled we need new tools. New tools. First clumsy and primitive, then refined and accurate. Such are the tools of futuring.



Futuring, a new word coined by a new profession of futurists, is the art and sometimes science of anticipating the future. As the adage goes, those who anticipate have advantage over those who don't. Every culture captures this wisdom in the lessons children are taught. That wisdom is more valuable in a world where the future presents itself at ever-faster speeds. And so, we invent and hone new tools. One tool we call upon is a futures study. This particular study concerns the future of quality.

In an effort to anticipate the future of quality, ASQ undertook its first futures study in 1995 under the leadership of then ASQ President, David Luther. The value of the study was such that ASQ has repeated one every three years since. This study is the fifth in the series, and from them we've learned a great deal about the future. The first learning is that try as we might, we are ill-equipped to look very far into the future. Change is happening faster than can be imagined. The second learning is that whatever we know about the future will be overcome by what we can't know about the future. It is certain that the future will surprise us. The third learning is that "globalization," however you define it, is the single largest force of change to reckon with. It is the only force of change that has been constant across all five ASQ future-of-quality studies.

Those three learnings—the rate of change is accelerating; what we can anticipate will be overcome by what we can't anticipate; and the immutable reality of a shrinking world—set the context for us all. And now we go back to the wisdom of the ages—those who anticipate have advantage over those who don't.

Now, for the use of this study. While many studies attempt to provide answers, this one is aimed at provoking questions. More so, at provoking dialogue. Over the course of the next three years, ASQ will use this study to provide focus for a

series of "stakeholder dialogues" where we will invite members and others to join us in conversation about the future of quality. The seven forces, the scenarios, and the implications are seeds for the conversation. Seeds that provide focus, but not much limitation. We will host these conversations all over the world, and from each conversation we will capture the wisdom of the participants. Conversation by conversation we will see patterns and themes begin to emerge; from those patterns and themes ASQ's Board of Directors will consider its strategy in response. But that's just ASQ's use of the study.

We encourage, and in fact will support, organizations that want to use the study to ponder the implications for themselves. ASQ will host conversations in organizations in exchange for the benefit of understanding the future of quality. Company by company, organization by organization, school by school, hospital by hospital, we gather invaluable insights into the issues and challenges organizations look to address.

And then there's a third, and critically important, use of the study—its use to the individual. Anyone wondering where careers may go, what skills will be in demand, or where opportunity may lie will find in this study valuable pointers and hints.



Paul E. Borawski, CAE
ASQ Executive Director & Chief Strategic Officer

The ASQ Futures Study comprises three major components:



- Identifying the key forces that are most likely to shape the future of quality.
- Developing alternative scenarios describing how these forces might unfold.
- Determining implications for organizations and the quality field, for quality professionals, and ultimately for ASQ.

Key Forces

An expert panel of nearly 100 thought leaders of the quality movement from around the globe, representing every sector of the economy, shared their insights in order to gain a credible understanding of the potential impact of current trends on the future. Through multiple rounds of consideration and online dialogue, the panelists arrived eventually at a final-round rank order of their choices—the Seven Key Forces shaping the future of quality.

- 1. Globalization** dominates the future of quality, as it does so many other aspects of life. This is the only force that shows up on each of the previous four ASQ Futures Studies. The many facets of globalization create enormous opportunity—and complexity. Organizations once called “international” are now labeled “global,” suggesting perhaps less of a gravitation toward national identity or country of origin. Globalization is necessitating global supplier networks and driving the urgent need to manage global quality platforms across multiple organizational sites. Variation in approaches is seen as an unnecessary luxury. Standards will continue to rise in importance and use. Organizations also are becoming independent of location and “space” in terms of the talent they need to thrive. Consumers, likewise, are becoming global in their outlook and habits, aided by the Internet. They consume the products and services that best fit their needs, wherever sourced. Globalization is driving huge new consumer markets, creating both opportunity and concern, which are reflected in forces discussed later. Globalization will drive trade policy and impact trading partners in new, unimagined ways. The concepts of “national” and “regional” will have less meaning to everyone in years to come.
- 2. Social Responsibility (SR)** roared to the second position in the 2008 rankings of key forces. It is the first of several forces to reflect the growing concern of citizens for the fate of the planet. As a result, organizations are realizing they must play an important, self-enlightened role as stewards of the planet. They acknowledge that being responsible is not only moral, but good business, if a business is to be sustainable. Recent large-scale examples provide ample evidence of the impact of irresponsible management. The impact reaches well beyond the company owners. Consumers are demanding more knowledge of company practices. Among the criteria consumers use in making their buying decisions, company reputation will assume a more significant place. As organizations set SR goals to respond to these demands, they will find they can rely on the concepts, techniques, and tools of quality to deliver on those goals. Ethics, transparency, social behavior, and environment fall into the broader considerations of SR, as does the “triple bottom line” of people, planet, and profit.
- 3. New Dimensions for Quality** – If control and improvement are the traditions of quality, it is clear that a new collection of competencies is needed if quality is to have much relevance in a world changing at an accelerating rate. Organizations are looking for leadership in creating marketplace innovations; in stimulating new ideas; in managing change at ever-faster rates; and in creating value for ever-more sophisticated consumers. Enterprises seek leaders who value organizational cultures that learn. One futures study panelist was brave enough to call these competencies the fundamentals of 21st century quality. Clearly, near-perfect product quality is an assumed requirement, no longer providing any sustainable differentiation in the marketplace. While assumed, perfect quality is not the outcome of chance. Organizations that take quality for granted will soon learn that lesson. Clearly, innovation without quality is a non-starter. The study participants are mindful of the fact that this force, or these forces, are at work in the *system* of the organization, not just in the products and services of the organization. Chaos and order must learn to live in the same space, and people systems will be taxed to keep up with the pace of change the marketplace demands. Organizations must master these abilities or give way to smaller, newer, more agile competitors.
- 4. Aging Population** is another force with multiple dimensions both adding to the problem and contributing to its solution. Life spans are increasing everywhere, and, as economies grow, and the middle class expands, healthcare is available to more people, though not to everyone. An aging population drives economies and organizations to respond to this large market need. Historically, the world has exploited the brawn and energy of its most

numerous population segment—its youth. As soon as 2025, the majority of the population will be 60-plus. Retirement is an invention of the last century whose ramifications are being fully realized only now in this century. The world never expected so many healthy, nonworking citizens, possessing the means to consume. This is the market opportunity and the crux of a social-system crisis in the world's most developed nations. The generation that inherits these realities will be challenged to find creative solutions the previous generation could not.

The aging population poses workplace challenges as well. As aging workers leave the workplace, organizations will be challenged to replace their knowledge and experience. It may well be that a creative solution entails a return to the workplace for significant portions of the aging population, allowing them to contribute what they know and to enjoy more productive golden years, while at the same time generating unplanned tax revenue to alleviate social needs. The seeds of this trend have already been planted. Retirement may well be redefined, leaving retirement as we know it a relic of 20th-century history.

- 6
5. **Healthcare**—or more precisely the demand for healthcare—is clearly a by-product of the preceding forces on this list. Globalization is adding staggering numbers of people expecting access to healthcare. That growing global awareness of healthcare need is not always met with healthcare services provided. And the demands of an aging population, with means, will conspire to significantly heighten the need and demand for healthcare. Clearly, quality can play an important role in taking waste out of the system so that more people can benefit. Neither the wealthy, nor the poor, can afford the increased societal costs as healthcare consumes an ever-larger share of GDP. Policy makers have their hands full with the challenges of equitable

access. They should not be taxed further by financing waste that often equals the actual cost of the care provided. Emerging biotechnology and nanotechnology advances, which hold the promise of curing disease and further prolonging life, add to the complexity of the healthcare world. With these fast-developing technologies in the healthcare mix, completely new quality sciences will be required.

6. **Environmental Concerns** have not been on the key forces list for nine years. The strength of the return of this force cannot be fully realized without considering related comments on social responsibility and the force of climate change (which did not make the short list of key forces). In 1999, environmental issues were spoken of as a concern for the future. It's clear that in 2008 that future is here. There is urgency now, and concern.

There is hope in the demands consumers will make of producers. There is hope in the growing awareness within organizations of the economic value of reducing environmental impact. There is hope that the force of globalization will create regulations and standards of accountability by which all producers everywhere can be measured. But hope, the research panelists suggest, will not be enough. Action is needed.

Scarcity will drive cost, and cost will drive changed consumer behavior. Or, so macroeconomics suggests. This may be another source of hope. But there was no hope for the remediation of damage already done and the fear of the damage of explosive consumption the world faces.

Again, quality can contribute and affect improvement. For organizations that want ways to manage their systems, quality provides the concepts/tools/techniques, and even a standard. For policy makers who welcome new thinking at the table, the quality movement wonders how to get a seat.

7. **21st Century Technology** – The most talked-about feature of current technology is the startling rate of change it is experiencing and its resulting disruptions and discontinuities. Technology's impact, while difficult to forecast, is certain to surprise in ways that disrupt our models for nearly everything we think we understand.

Some believe that technology will deliver solutions for sustainable energy, which will have the added impact of altering the political landscape of the world. Some believe technology will deliver solutions for fresh water scarcity and global food shortages. Certainly genetics, biotechnology, and nanotechnology have the potential to shape the world more radically, and faster, than information technology has. And everyone agrees information technology and the Internet have not finished changing everyday life. Who would have ever thought a terabyte of storage could be held in your hand, much less cost less than a day's wage? And that was yesterday.

If technology is a driver of change, think of quality as the navigator. It is difficult to imagine technology going anywhere without quality—but not today's quality. Therein lie great challenge and opportunity for quality.

Scenarios and Effects on Key Forces

Armed with this expert view of forces shaping the future, ASQ Past President Greg Watson developed four brief alternative scenarios depicting a spectrum of potential future world conditions. One scenario reflects a “utopian” world where the forces of good overcome the forces of “evil” that cause the degradation of our global condition. Another scenario describes the opposite condition where the forces of “evil” win and humankind does not resolve the issues, concerns, and challenges that it is facing. This situation is often called a “doomsday scenario.” Between these two limits of the future lie two alternatives—a “preferred scenario” and a “business-as-usual scenario.”

Global Transformation: Innovation of a Complex System

The threat of drastic changes in humankind’s way of life from negative forces facing the entire world is met with a ‘rebound’ effect as people stop their constant arguments about what will happen and embrace the need for aggressive corrective action. The aim of this action is to halt and then reverse the negative effects of those forces that are unpreventable and to seek solutions to prevent those negative forces of change that are avoidable. Quality methods (defined in their broadest sense) are a key change catalyst that enable humankind to consider new opportunities and define action alternatives by focusing the best minds, methods, and means to drive improvement in areas that threaten the infrastructure of the world (economic, environmental, political, and social). To drive the outcome of this scenario, technology, finance, and quality methods are the focusing forces that are used to create and implement a global investment strategy that is able to achieve broad systemic solutions to the world’s most pressing problems.

Notice how the forces for change influence different dimensions of this scenario:

- **Globalization** – Environmental, political, and social issues have been treated as an international system by a united confederation of the world’s governments that controls the global economy.

Quality is used to focus on the elimination of waste, fraud, duplication, and bureaucracy and assure a responsible application of resources to facilitate resolution of the most pressing global issues.

- **Social Responsibility** – The need to balance the dichotomy between the have and have-not nations and to have a more equitable development of the world is broadly recognized along with acceptance of social responsibility among the world’s leading nations. Principles of quality in governance are applied to all public and private sector institutions. A global standard on social responsibility and corporate governance and a methodology for effective self-assessment for governance excellence have met with broad acceptance.
- **New Dimensions for Quality** – The emphasis of the quality movement shifts to corporate governance and waste elimination. It concentrates on the resolution of the multi-dimensional problems by focusing on a broad definition of “total quality” that addresses all aspects of social systems in both the public and private sectors. Quality methods have been integrated into the governance excellence self-assessment process and are accepted as the global best practice for daily business analytics in organizational performance management

Utopian Scenario



systems in production, service, healthcare, energy, education, transportation, and construction.

- **Aging Population** – All three elements of the aging population crisis have been successfully resolved. While healthcare improvements have extended the lifespan expectations, actions for restructuring economic conditions have helped to resolve the fiscal impact of this longevity increase. Retirement systems have been redefined to accommodate the expanded productive lifespan of people. A second emphasis has been the use of information technology methods (such as adaptive learning and artificial intelligence) to capture the knowledge of the aging population and integrate it into the world’s technology systems. The ability of an older generation to work productively for longer periods means that they can forsake a purely political motivation, apply their accumulated wisdom, and

work for the greater good of humankind and society. They can turn their talents to the restoration and improvement of the world’s urban infrastructure systems for housing, transportation, energy, communications, water, and sewage.

- **Healthcare** – Genome technology, nanotechnology, and biotechnology merged to create core solutions for the longevity of productive human life. Sound quality management practices have been implemented in healthcare systems to eliminate waste, streamline procedures, and assure the consistent delivery of the “best theoretical care” for the major ailments affecting humankind. Distribution of care in this system has been assured through a “kiosk” system of diagnostic stations that is linked through information technology for real-time assessment of ailments and to nanotechnology delivery systems that provide prescriptive treatments

“at the point of contact” at the diagnostic station. This healthcare system operates based on an extension of Internet technology as a means to improve accessibility of the healthcare coverage.

- **Environmental Concerns** – Environmental degradation has not only been halted, but levels of greenhouse gases in the atmosphere have been rolled back to the level of 1990. A system of global pollution sensors has been deployed into space to observe polluting activities and issue summary judgments and punitive fines against the perpetrators through a system developed to use the Internet technology for enforcement of global “equity initiatives” related to improving the environment. Clean energy and pure water have been developed and deployed to all areas of the globe so that deserts now bloom and are productive sources of foodstuffs and the grain needed for biotechnology energy products. Active research on long-term solutions to clean the oceans of years of accumulated pollutants is under way to assure that no surprises lurk in the future to once again threaten the existence of humankind.
- **21st Century Technology** – Although the world is being depleted of many of its natural resources, focused global investment in technology has discovered the means to apply nanotechnology to eliminate dependency on fossil fuel as a global energy source. Biotechnology breakthroughs increase the capability of healthcare to manage global systemic issues while also developing solutions for controlled harvesting of new sources of food for feeding the global population. Technology for desalinization and purification of water are transferred from the American space shuttle systems and made commercially viable on a large scale to resolve the global water distribution problem.

TABLE 1 Forces of Change From All ASQ Futures Studies

1996	1999	2002	2005	2008
Changing values	Partnering	Quality must deliver bottom-line results	Globalization	Globalization
Globalization	Learning systems	Management systems will increasingly absorb the quality function	Innovation/creativity/change	Social responsibility
Information revolution	Adaptability and speed of change	Quality will be everyone’s job	Outsourcing	New dimensions for quality
Velocity of change	Environmental sustainability	The economic case for the broader application of quality will need to be proved	Consumer sophistication	Aging population
Increased customer focus	Globalization	Global demand for products and services will create a global work force	Value creation	Healthcare
Leadership	Knowledge focus	Confidence in business leaders and organizations will decline	Changes in quality	Environmental concern
Quality in new areas	Customization and differentiation	Customer expectations will continue to rise		21 st century technology
Change in quality itself	Shifting demographics			



Global Adaptation: Evolution Toward a Synergistic Society

The increasing atmospheric hole in the Southern Hemisphere greatly increased global warming and the subsequent loss of major portions of the Antarctic ice shelf in late 2008. This became a wake-up call to global leaders to unite for the common good in the cause of preservation of the environment. In the political world, the United Nations decided to expand its emphasis on the principles of quality governance by providing a global quality management program for the 200 national governments holding membership. This program was developed to decrease waste, fraud, and abuse in public funded programs and to establish a global “transcendental culture” based on proven principles of quality management. More than half of the governments have elected to participate in the program; a few major government holdouts have limited the effectiveness of the whole program. In summary, many of the dimensions of the social and environmental threats that were perceived in 2008 have been halted, but in many cases, not before there has been significant damage. Focus on repairing social, fiscal, and environmental infrastructures through evolving global improvement programs is a major role of the World Quality Alliance.

Preferred Scenario



Notice how the forces for change influence different dimensions of this scenario:

10

- **Globalization** – Recognition of the need for collaboration to address the systemic problems of the world has caused a rapid consolidation of three forces for change: 21st century technology, new dimensions in quality improvement, and social responsibility combined with focused use of the fiscal resources of the world. These forces are in the process of being coordinated to address the chronic problems related to the environment, healthcare, and aging.
- **Social Responsibility** – Progress on the front of social responsibility includes a new standard for self-assessment of “quadruple bottom-line initiatives” using the perspective established for all key stakeholder communities. In addition, standard organizational measures have been developed for all major categories of public and private sector enterprises and these have also been promulgated as a voluntary international quality standard. Finally, a global quality prize for excellence in governance has been developed by the World

Quality Alliance as a means to focus organizational leaders from all sectors in their responsibility for good governance and to encourage the development of role models of excellence. Since all of these efforts rely on voluntary compliance, the major weakness is no longer in definition of the approach, but in its effective deployment and demonstration of subsequent related results.

- **New Dimensions for Quality** – A coherent quality methodology has evolved that has been demonstrated to be applicable in both traditional and non-traditional fields. A comprehensive systems approach to quality, as a further extension of the Lean Six Sigma methodologies, has been developed to improve the world; however, resistance to its universal adoption as a global best practice is prevalent in many areas because they resist the “industrialization” of application to their social systems. Much effort has been made to demonstrate the value of this program through focused improvement projects at the national level, with technology transfer to all other nations, and new knowledge gained in such projects is included

in the global Quality Body of Knowledge (QBOK®). Quality systems, measures, and tools have been embedded in most software systems and evaluated by a global council of “quality guardians.” While much has been done, much still needs to be accomplished. Most efforts are required in the area of implementation, rather than development.

- **Aging Population** – One area of difficulty in driving improvement is the acceptance of senior citizens of a continuing productive role in society. Many feel that they are entitled to the retirement that was promised to them and that any reduction in their benefit expectations is tantamount to deceit and shows lack of faith by the world’s politicians. Since the majority of the world’s population is above 60, and they tend to vote as a bloc on aging issues, not much progress has been made in redefining social benefit programs for elderly citizens. There are successes in other areas: transitioning retirees into “second or third careers” has long been the practice in Japanese management; preserving the knowledge base of retired workers through critical incident interviews using artificial intelligence diagnostics to reveal key workers’ knowledge; and developing communities of practice where senior citizens mentor young leaders and workers in return for “credits” redeemable for the education of their children or grandchildren.
- **Healthcare** – Quality application for the healthcare community has been one of the greatest successes in this scenario. Standard procedures for most major illnesses have been developed, professionally reviewed, and disseminated as best practices. Movement of standard practices to a continuing achievement of excellence is accomplished by comparing performance for all of these procedures against the “theoretical best” capability for care. Elimination of waste in the healthcare system has been credited to the wide adaptation of Lean Six Sigma methodologies as used in service industries and developed for transfer into healthcare

organizations. Healthcare has caught up to manufacturing in terms of its acceptance of quality practices and methods. While good healthcare is now universally available in most developed nations, recurring problems with access to high quality care is not universal in the developing world.

- **Environmental Concerns** – Reforestation and selective forestry harvesting methods that were developed in Scandinavia have been distributed as a global best practice, and the world has now experienced a reduction in the carbon cycle because of the massive increase in planted trees (10 billion trees planted in 10 years). While this program has helped to rollback carbon emission problems, it has also allowed space for a more enlightened approach to the needs of the world's developing nations to exploit their natural resources in order to develop a strong economic base. While global warming was not prevented, the effect has been to halt growth in the collapse of the Arctic and Antarctic ice caps. This success has prevented potential major catastrophes and the effect of rising water on polluting coastal lands and ocean food banks. A major international effort continues to manage the environment better through technology investment in research fields that have promise for rapid gains in the greenhouse gas system in the atmosphere. The world has set new aggressive goals for balancing the environment by focusing financial and technological efforts on the full spectrum of systemic environmental issues facing the whole world: making solar and wind energy economical; providing useful energy from fusion; developing carbon sequestration methods; and harnessing the nitrogen and hydrogen cycles to sustain broad applications of fuel cell technology for energy storage.

- **21st Century Technology** – Increased technology investments have been made in alternative fuels, fuel cell technology, and power sources from non-fossil fuels. A global investment program developed by a consortium of major trans-national corporations collaborates across European, American, and Asian research and technology organizations. The research agenda concentrates on issues related to water purification, food technology, biotechnology, non-conventional power sources, and fuel-efficient mass transportation systems. As a step toward enlightened social responsibility, this research group invests half of the profit from commercialization of these enterprises to elimination of the debt burden of developing nations and an equitable compensation to countries that elect not to exploit their natural resources in ways that lead to environmental degradation.





12 Business-as-Usual Scenario

Global Stagnation: The Halt of Human Progress

The promise of technology has not been fully achieved, and the optimistic feeling that technology can resolve all of society's problems has dissipated. The rate of progress in technological advances over the second half of the last century has decelerated and society has not been able to absorb new technologies. The evidence of technological slowdown exists in several advanced technology applications: nanotechnology is limited by measurement system capability; artificial intelligence is limited by the lack of decision algorithms to define new learning patterns; and telecommunications advances are limited by the burden of maintaining legacy systems. Since technology could not be diffused into appropriate social applications at ever-increasing rates, a destructive tension has evolved: Potential advances for the benefit of humankind cannot be deployed due to the inability of humankind to manage discontinuous, disruptive change. In short, people have come to fear the impact of new technologies in their personal lives. This trend began with genetic biotechnology applications in agriculture during the mid-1990s and expanded to include all innovations that confront people's lives with major change. Other observations may be made about this scenario: First, there has been a systematic weakening of the United States' political-economic power in the world and a concurrent progressive growth and expansion of the political-economic power of developing nations (most notably China and India), which have come to dominate the world's economy. Additionally, strength in a unified Latin American market has occurred. The Amazon Pact, Association of Caribbean States, MERCOSUR, and NAFTA trade agreements consolidated to encompass the Caribbean, Central American, South American, and North American states in a more viable Free Trade Area of the Americas (FTAA) agreement with inclusion of the United States and Canada as equal partners in a democratic trading

union. Following the inclusion of Russia and all the central European states, the European Union (EU) increased its political-economic influence. However, EU market growth came not from innovation, but as a natural consequence of expanded membership and the fiscal realignment based on a continuing weakened American dollar. The impact of the shift into these regional trading centers has fundamentally changed the global marketplace, forming silos representing clusters of nations that have created a modern form of self-preserving isolationism.

Notice how the forces for change influence different dimensions of this scenario:

- **Globalization** – Although the world is faced by an imperative to work together on global solutions for systemic problems, regional alliances prove to be more compatible with national politics. Growing distrust of “Western” motives causes isolation of Africa and encourages development of strong trade confederations among Far East, Americas, Europe, and Middle East nations. Thus, the world's fiscal resources are fractured and are not concentrated on solving critical problems such as healthcare, environment, aging, and social responsibility. Suspicion and skepticism about motives of the differing regional alliances causes lack of acceptance of the technological advances and thwarts the embrace of a ‘transcendental’ quality philosophy or set of methodologies for problem solving and innovation. The world is fractured and all the king's horses and men can't seem to put it back together again!
- **Social Responsibility** – Initial steps have been taken to improve corporate governance, but concerns about regional competitiveness inhibit full transparency and openness of activity. Social responsibility operates reasonably well within regional alliances, but trade boundaries and growing political strength of the regional groups divides the world in the same way that national boundaries had in the past.

- **New Dimensions for Quality** – Quality professionals have managed to develop a set of expanded tools and methods that provide improved capability to address all critical issues facing the world, but these methods are met with exceptional resistance and are considered “American” methods that won’t work across cultural boundaries. Rejection of philosophies and methods based on their region of origin and a not-invented-here syndrome exist in many regions. Thus, while quality can provide answers, it is inhibited from doing so because quality has yet to become a part of a transcendental world culture that bridges local, national, and regional boundaries.
- **Aging Population** – Treatment of the aging problems slips in priority, as resources are not available to address the issues and senior citizens are left to fend for themselves based solely on their personal investments. Regions care for the aging citizens based on the traditions of the dominant regional culture; global solutions are not available to deal with these issues. Some regions develop means for senior citizens to make meaningful contributions to society, others provide them with family-based care, and still others view them as a burden to be cast off into an asylum at the end of their productive days.
- **Healthcare** – Managed healthcare is still not available universally, and the best medical treatment is available only at high prices for those who can afford it. While there are many advances in the capability of healthcare services, availability of these solutions is limited and varies greatly across the global regions.



- **Environmental Concerns** – Environmental degradation is still occurring; however, its rate of change has been arrested and a reasonable possibility exists for neutralization of the collapse within 10 years. The biggest hindrance to addressing worldwide environmental system degradation is the conflict between trade groups that equate access to power, ability to exploit natural resources, and need to improve transportation systems with their right to economic self-determination. The emerging economies of these nations maintain an entitlement to these developments, as they are the fuel for economic growth to assure the well-being and quality of life for their people. Compromise between developed nations and developing nations has not been possible; the developing nations see compromise as a ploy by the developed nations to maintain their superior position.
- **21st Century Technology** – The potential contribution of technology for creating a better global lifestyle and resolving social, political, and economic issues has been severely dampened by a global backlash against broad-scale adaptation of all things new. The major rays of technological enlightenment have been the acceptance of a few technologies for controlling the carbon and nitrogen balance in the atmosphere and a broad acceptance of energy-efficient and alternative-fuel vehicles.



14

Doomsday Scenario

Global Disintegration: The Crisis of Environmental Collapse

Politically motivated, short-term thinking based on summary data has precipitated an unheralded collapse of the global ecological system. Humankind has doomed itself by using optimistic estimates to establish politically correct goals for reversing the global ecological damage by 2050. Ignoring data that indicated a systemic problem based on increasing rates of change in climatological conditions has brought society to a “tipping point” where the negative effects of environmental degradation can no longer be reversed. Global warming collapsed the polar ice pack in half the time that was estimated in 2000. This caused an unexpected fiscal impact as the emergency actions required to cope with the rising ocean levels were a drain on a global economy already burdened by years of war. “Too little, too late” is the theme as humankind watches its world

disintegrate, having little capability to intervene. The voices of science and quality are not brought to bear to combat the environmental crisis. Everything Al Gore had described comes true; however, the more conservative estimates that he tempered for public consumption do occur. The rise in the world’s oceans subsequently pollutes the seas and thereby causes a threat to the world food supply in two ways—salinization of productive farmland and pollution of the oceanic food chain. The world is consuming its natural resources at a pace that is faster than the ability of technology to replace “traditional” resources with alternatives. Thus, the promise of technological salvation now seems empty. The result is that the depleted fossil fuels, rising food costs, and food and water shortages give rise to mass famine and drought. These concerns become magnified as no agreement can be reached on collaboration, transparency, and participative decision-making and social democratic governments are replaced with strong military-backed dictatorships. As a result of inequitable distribution of

global resources, have-not nations combine forces with major developing nations to fight a military battle against North America and Europe over access to and consumption of resources. As a result of this warfare, social systems implode. There is a return to social conditions that resemble the Stone Age as global transportation, mass communication, power generation, and political systems have been destroyed.

Notice how the forces for change influence different dimensions of this scenario:

- **Globalization** – The world loses its global perspective, as national and tribal interests dominate the agenda of local governments and disorder prevails internationally.
- **Social Responsibility** – There is a total breakdown in global social responsibility as each nation seeks to do what is best for its own constituency and fails to generate a common bond that connects all humankind. The strong dominate the weak and the only rule that seems to operate well is that “might makes right.” Principles of self-preservation overwhelm and replace an emphasis on the “quadruple bottom line”—the environment has collapsed, thereby destroying the financial structure and leaving the social and cultural elements as causes of friction and rallying points for warfare.
- **New Dimensions for Quality** – Quality as a positive global force has died along with the rest of humankind’s socializing and unifying structures. However, one emphasis of quality practices and methods remains—application of quality methods for the effective use of military operations to subject the world to a power-dominated dictatorship.

- **Aging Population** – The aging population ceases to be an issue as famine, drought, war, and pestilence create massive genocide conditions throughout the world. The youth and weaker aged populations are first to feel the brunt of these conditions.
- **Healthcare** – The healthcare system is strapped financially and in its capability to serve in the face of social collapse. People are unable to correct the waste in the healthcare system; the degrading of all global social systems makes service in the healthcare system even more wasteful and inefficient.
- **Environmental Concerns** – While the environment remains a big concern, the focus is one of victimization—people wait to see how weather will affect them next as climatic conditions dictate the quality of daily life.
- **21st Century Technology** – Fiscal limitations of the economy have caused technology to revert to a “tinker’s trade” rather than a systematic, scientific program of research. As a result, inventions occur, but their broad-scale acceptance and use is impossible, as the world has reverted to an economy based on barter resembling a Middle Ages craft-based culture instead of an innovation-driven mass-production system.



The scenarios serve as narratives to help people imagine what the world might be like in the future as influenced by the forces of change for quality. This sets the stage for the third phase of the study—the implications. This is the most important step, as it moves each of us to the edge of doing something—change. Change will happen. The hope in preparing the study is to move us from reacting to change to leading the change, or if nothing else, to forestall being caught by surprise when change arrives.

Rather than being an exhaustive list, the implications below are meant to prompt your own thinking. Using the study as a starting point, ASQ will conduct a series of stakeholder dialogues where we will explore the implications more deeply. The learning from those dialogues will help inform ASQ strategies and plans. Helping us anticipate the future, so that we can provide leadership to those who look to prepare themselves for the future.

The thoughts below were gleaned from the responses of dozens of leading thinkers and experts in quality, plus ASQ's Board of Directors and staff managers. The invitation was to envision the implications of the key forces and scenarios to quality, to organizations that seek to benefit from quality, and to those who practice quality in organizations and communities.

The list of implications is long and took many paths, with many interesting wanderings. This is not a search for right answers, rather clear thinking about the right topics. We invite you to consider the implications and use these to stimulate your thinking. Better yet, use the study to stimulate a discussion about the future of quality. But don't stop at discussion. Actions will matter. Whether those actions prepare you for an exciting, meaningful future, or those actions serve to prepare your organization for greater success in the future, or inspire you to use your knowledge to make the world a better place. Actions will matter.

Generalizations

Global, social, environmental scale

It is striking, although not surprising given the news of the day, that the forces of change and the responses they provoked have taken a decided turn up and out of the organization where quality has grown and matured. While each of the forces can be considered at the level of organizations, the panelists and respondents often turned in different directions with their thoughts. Most offered insights on how quality can and should be directed at making the world a better place. Clearly it's seen that statistical analysis methods and the tools of control and system- or process-based problem solving and improvement can work as well on large-scale issues as they do on small-scale issues. There is some frustration over the ability to get to the problem solving table, but little concern about the value of being there.

"As with any incredible opportunity, this is not for the faint of heart."

– David Spong
Boeing (Retired)
Two-time Baldrige Winner
ASQ Treasurer



Getting the message heard

That sets the stage for perhaps the most challenging implication: The greatest challenge for quality is equipping those who understand it with the ability to communicate what they know to the audience who can benefit from it. As the proverbial saying goes, “you can lead a horse to water, but you can’t make it drink.” In so many words, that is the lament of the quality community about those who “don’t get it.” It may also be said of the professional in need of skills they may choose not to develop. As many of the voices that once provided the great insights—Deming, Juran, Ishikawa, Masing, and Crosby—are no longer speaking for quality, new voices, more voices, are needed. The quality professional needs to know the language of the audience. Teacher, nurse, lawyer, reporter, small business owner, entrepreneur, assembler, designer, manager, accountant, mayor, executive—it’s their languages quality must learn, with sensitivity for the culture where the message is directed.

Process to systems (Call it the “Big Q”)

The future calls the quality community to grow in its skills of system thinking and system problem solving. There are few instances where quality, at a process level, can afford not to consider the broader implications of change at the system level. As processes have become an organized system of an enterprise through national quality award programs, so too have enterprises become more complex systems as they, and their supply chains, become global in scope. And as quality proves its value for global enterprise, it is now called to address even larger system issues such as sustainability. Process thinking alone will not be sophisticated enough for issues of global scale.

The impact of unintended consequences offers a second argument in favor of system approaches. The near-perfect product environments and breakneck speed of change provide little margin of error for the

unintended consequences of changing process without consideration of the downstream effects.

Speed

It seems so obvious as not to need mention, but speed, the rate of change and all its consequences, is only going to accelerate. This observation has been true since 1995 when ASQ began these structured looks into the future. Though not called out as one of the key forces on its own, speed and its impacts are embodied in the list of forces that surface at the top. But whatever view you take, speed is propelling us at ever-higher rates. Speed requires rates of adaptability and agility that are already proving difficult for organizations and individuals to cope with. We ignore speed at our peril. And we must note that the human condition generally resists change. So, organizations and individuals who master the art, or emerging science, of change will have advantage in their favor. It may be enough advantage to make the difference between survival and extinction.

Relevance, knowledge, and learning

Someone said, “Maybe the reason quality got so much attention in the ’80s and ’90s was because it was perfectly attuned to the needs of executives at the time.” There’s wisdom in that quote, and those seeking to attune quality to the early 21st century need to face a different world—a global marketplace, work force, and supplier network. A world of ever-shorter life cycles, of an Internet-enabled customer with significantly greater buying sophistication. Of a consumer looking for perfect quality and an enjoyable experience, from an organization that makes a small footprint on the environment and works to make the world a better place, too. If the stock in trade of quality in the ’80s and ’90s was control and improvement, those are still needed tools, but not the tools that assure quality will be fully embraced by today’s executives and

managers. It’s been said that the half-life of knowledge today is less than two years. And, there are mounting concerns about the knowledge that retiring baby boomers will be taking out of organizations when they leave. Somewhere in the confluence of these issues, the quality community knows how to make organizations robust, and must learn to do so in a new world.

The bottom line, the top line, and the triple bottom line

So much of quality’s attention is spent on the bottom line. And while there’s nothing wrong with contributions to the bottom line, quality has much to offer the top line that sometimes goes less unnoticed and undeveloped. Understanding the customer’s requirements, driving satisfaction and loyalty higher, anticipating the customer’s needs, assuring an experience people will talk about, designing for high-quality initial yields—all these and more contribute to the top line. And soon sustainability and the triple bottom line will roar into the objectives and goals of all organizations.

“Change and innovation are as much attributes of quality and how we manage quality as they are of the products, processes, and services that are produced and delivered.”

*– A.V. Feigenbaum
General Systems Co., Inc.
ASQ Honorary Member*

Insights From the Panelists

There were literally hundreds of insights offered by the panelists. Here is a representative sampling to further fuel your thinking.

Implications for Quality

1. Clearly quality is being called outside the boundaries of an organization; first by global supplier networks, and then to larger social concerns such as healthcare, environment, and social responsibility. Cultures will shape quality by way of consumer expectations, consumer behavior, and work cultures.
2. That quality has changed or was forced to change is a very debatable issue.
3. Control and improvement methodologies will need to evolve for ever-shorter production cycles.
4. Get ready for quality to be defined in new places and in new ways.
5. Global standards will help with global platforms and solutions.
6. With the Internet reaching everywhere, quality will know no national boundaries.

“The future success of organizations devoted to enhancing quality will depend on their degree of commitment to encouraging modern statistical practices.”

*– J. Stuart Hunter
Princeton University
ASQ Honorary Member*

7. The notion of business success will broaden beyond profit to include the environment and society and intangible dimensions of management.
8. Global perspectives are emerging as the context, and scope, of problem solving.
9. The knowledge and ability to apply the tools of quality continue to be drawn out of the profession and into the hands of everyone in the organization.
10. Measuring waste and managing its reduction will continue to focus quality on the cost side of the equation. Quality will need to work extra hard to balance its ability to contribute to the top line—revenue. Understanding customer needs, designing for quality, and speed to market are at risk, as is quality’s contribution to enterprise management.
11. Change and innovation are as much attributes of quality and how we manage as they are of products, processes, and services that are produced and delivered.
12. Finding ways to take waste out of healthcare will continue to increase in importance with more people deserving access to healthcare along with the health complexities of long lives.
13. Healthcare could benefit from expanding its uses of traditional quality tools.
14. Emerging technologies will give rise to new quality disciplines.
15. The benefits of quality will be applied to an ever-larger share of the economy.
16. Social responsibility will demand that ethics and integrity become system managed.
17. To increase its impact, quality must find its way into educational systems so graduates enter the work force equipped to advance quality practice rather than stumble onto it.
18. Quality must become comfortable with chaos and control coexisting.
19. As quality moves into areas less tangible than manufactured goods, it will increasingly become an issue of culture; a “quality mind-set” is needed.
20. The quality of data as the product of myriad sensors producing time series composed of multivariate measurements in varying dimensions is often spatially located. This plethora of data will serve only to pollute clear thinking and rational decision making if it is poorly designed, managed, and analyzed. The theory and practice of statistics devoted to these new data sources is beginning to surface.
21. There are never better times for quality than times of crisis. This is such a time.
22. The forces taken out of context as drivers unrelated to each other offer a weak appreciation of reality. Indeed the forces create their own system of interactions, which understood together, offer more valuable insights about the future. This is systems thinking.
23. The combination of forces may have different concentrations in different regions, and different market segments adding more complexity to organizations in search of success.
24. Quality must align with sustainable results.

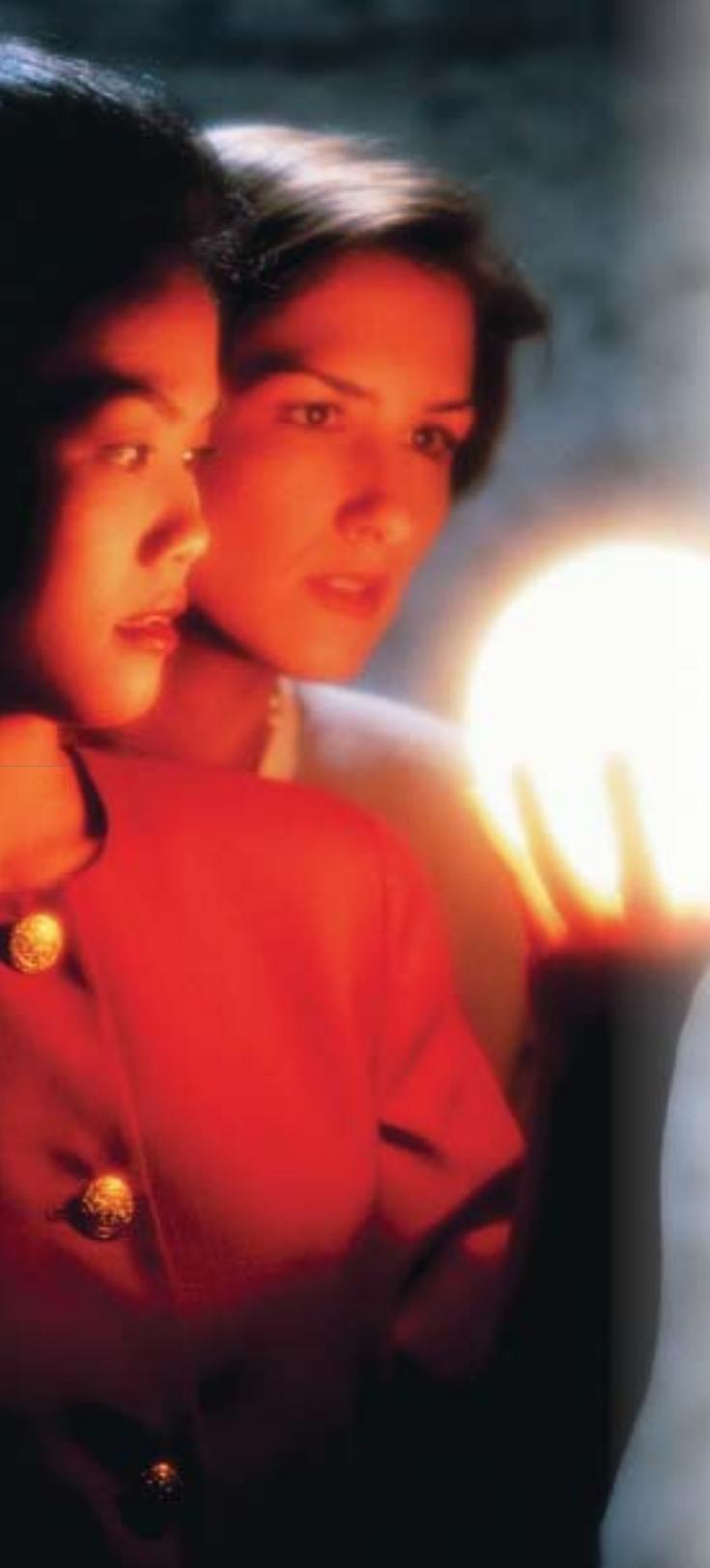
Implications for Organizations

1. Consumer knowledge of SR will shape consumer buying preferences; organizations will need more than SR marketing to garner consumer favor. At the same time, a definition for SR is still a moving target and the benefits and trade-offs are not broadly understood.
2. Changing workplace demographics will demand creative new employment practices particularly in developed nations with shrinking populations.

“The story of three masons is widely known in the field of quality motivation. On being asked what they are doing, the first mason replied, ‘I am a mason,’ while the second mason said, ‘I am working for €15 an hour.’ The third mason gave the following answer: ‘I am building a cathedral which will stand here for many years and serve as a spiritual place of rest.’ Furthermore, the answer of the third mason concerns the quality, which is more intrinsic and can be deployed to more detailed items. Quality is the important element of human satisfiers. Investigating them more deeply and specifically is undoubtedly the key to unlocking the secret of human motivation. This problem will become more and more important in the coming affluent 21st century.”

*– Yoshio Kondo
Kyoto University
ASQ Honorary Member*

3. Organizations will increasingly look to global system approaches that include supplier networks to manage their performance.
4. As finding knowledge becomes more complex and difficult, productivity is reduced. New organization designs are needed to cope with this reality.
5. Quality culture (often discussed by quality executives) will take on more importance as global organizations look to create consistent performance outcomes across many cultures.
6. Customer expectations today demand quality, but quality of product, service, and every touch point is not enough unless it is met with speed, agility, and accuracy.
7. Near-perfect quality has become an assumption in the marketplace.
8. The importance of standards will grow in managing global enterprises (as well as trade) as variation in approaches that serve no purpose or value to outcomes will be seen as waste and subject to management.
9. Monocultural directive approaches will yield to multiculturally-optimized system solutions.
10. New measurement and inspection techniques will be needed for nano and bio applications.
11. Quality standards will vary to suit the values and customers of the targeted market and its unique society; simultaneously, the sub-cultures of each society will globally seek products and services meeting their unique quality standards.
12. New standards for quality governance are being demanded to protect the future interests of all stakeholders.
13. Related to changing workplace demographics, employers should expect more contract employees and consultants. New motivation skills will be needed as well as new learning about satisfaction and loyalty.
14. Today’s middle-aged “boomers” will give way to a smaller youth market.
15. High levels of product quality will become an expected requirement.
16. Globalization will drive ever-faster changes in customer requirements, and ever-greater marketplace complexity, requiring new forms of leadership and new ways of practicing quality.
17. Revitalization of use of basic quality principles and tools will be applied to new complex problems in order to realize the unlimited power of people’s creativity.
18. Organizations must prepare for change-oriented cultures and values that support quality in this climate.
19. Sustainability will become as much a concern of quality management as product quality once was. Waste elimination.
20. Quality’s contribution to “foreseeable” results—new product introductions, R&D payback results, better sooner.
21. We’ll see an increase in moving from quality of product to quality of management and the organization.



Implications for the Profession

1. Get ready for increased multi-cultural work settings, and for approaches that are open enough to benefit from cultural differences. It's possible that standards will need to have cultural flexibility built in to account for differences in attitudes and approaches to work.
2. The traditional quality professional's skills of control and improvement need to expand to include innovation, creative change, value creation, systems thinking, and execution. New concepts, approaches, methods, skills, and expertise.
3. As SR enters the serious domain of organizational goals, organizations will look to professionals who can turn their SR intent into measured results. This has long been the domain of the quality professionals, who may now find a new career avenue for their knowledge and abilities.
4. As quality finds ever-broader application in society, there will be two application fronts: a) the leading edge of technical applications by advanced organizations that will evolve and contribute to new generations of quality, and b) a second front of simplified quality making its application more reachable for less technical sectors of the economy.
5. Begin expanding the traditional measures of performance to include social implications in balanced scorecards.
6. The systems approaches the quality profession has evolved through ISO 9000 and other management system standards will be valued by organizations looking to bring quality, environment, and SR into a holistic management system.
7. Get ready to understand a global world, differences in culture, uses of words, humor....
8. Innovations in quality are apt to come from any culture. Best performing organizations will learn how to balance standardization and improvement in multicultural synthesis rather than by monocultural directive.
9. New technologies and smaller products will demand new approaches to quality, including measurement and inspection technologies.
10. The opportunity for quality is expanding as humanity's view of itself and its world expands. The profession's contribution is also expanding beyond the traditional definition of the enterprise to problems that are global in scope and benefit.
11. How can quality move from better products to a better world in which to live? Be prepared for workplaces that are creative enough to retain the experience and knowledge of an aging work force in a workplace managed and led by 21st century generations.
12. The emergence of new technologies will give rise to new quality tools and techniques for the profession to learn, master, and apply.
13. Quality professionals will have to be more aware of international issues. Dealing with suppliers, colleagues, and customers from all over the globe will be the norm.
14. Be prepared to share your knowledge and expertise with an ever-growing number of your colleagues outside the quality profession. Find ways to simplify, remove jargon, and apply what you know as matter of common sense and practice.
15. The profession needs to understand how to manage relationships with distributors and resellers.
16. The opportunity is there for quality organizations and the quality profession to develop and grow to be the most significant entities in any business organizations for the 21st century.

17. Thinking about products and materials in full life-cycle context, reliability, durability, manufacturability, and disposal are all within the scope of the quality professional.
18. A quality professional who is not actively looking ahead to anticipate the impact of emerging technologies on product, process, enterprise, and the practice of quality will be fortunate to stay employed.
19. Anticipate work directed at less tangibly measured outcomes such as SR and ethics.
20. Acquiring the skills to deal with the burgeoning amount of data companies will have available to them in statistically meaningful ways will grow in importance.
21. The profession must rise to the occasion of addressing the pressing problems that these forces describe.
22. The profession must guard and assure that benefit results from all its practices and that it avoids paper exercises, compliance for compliance sake, and waste in any form. Where paperwork becomes the aim of quality, waste is assured in poor quality, high price, and wasted opportunity.
23. Quality leaders must become skilled in the art of “why” before moving to “what” and “how” and sharpen the focus of all endeavors on value—value to customer. Everything else is waste.
24. Be prepared for lifelong learning extending beyond normally expected working lives.
25. Where technical skills may once have been enough to succeed as a quality professional, the future of the profession will include a much more diverse set of skills, including system thinking, change management, statistical thinking, quality mind-setting, and finance.
26. The quality professional will need to be adept at managing risk in multinational supply chains.
27. Quality must continue to improve in its ability to demonstrate its efficacy.
28. A growing sense that the sphere of competition has become global and the standard that professionals will have to compete against will be the realm of the dedication to learn and the willingness to adapt new ideas. This may be particularly challenging in developed regions where quality of life and balance are attractive but a risk to professionals dedicating greater time to learning.
29. Advances in technology will virtually eliminate the need for inspection.
30. Work life will be extended beyond expected retirement ages to meet personal economic needs and to provide further knowledge.
31. Quality must be able to make top- and bottom-line contributions.
32. There will be a continued decentralization of quality as its tools become increasingly available (through computers) to everyone in the organization. The expert will become an advisor and consultant.

“Chaos and quality must live in the same house; routine and innovation must be handled at the same time.”

*– Eduardo Guaragna
COPESUL – Companhia
Petroquímica do Sul*





Lead Change

Questions to prompt your own thinking and make the futures study personal:

How can I as an individual professional knowledgeable of quality turn the challenges identified in this futures study into opportunities?

Do I have the necessary resources to navigate through the new environment, where familiar boundaries no longer apply?

Am I able to communicate effectively what I know about quality to those who need to know it? If not, am I willing to do what it takes to acquire that ability? How can the quality profession make this transformation easier for its members?

Is my organization taking full advantage of the capability of quality to make itself a robust enterprise in the new global environment?



Acknowledgments

2008 Futures Study Participants

SAL AGNELLO, AMERICAN SOCIETY FOR QUALITY, USA • **MANSOOR AL AWAR**, E-TQM COLLEGE, UNITED ARAB EMIRATES • **BJORN ANDERSEN**, NTNU, NORWAY • **JUHANI ANTTILA**, QUALITY INTEGRATION, FINLAND • **RON ATKINSON**, GENERAL MOTORS, USA • **CHARLES AUBREY II**, ANDERSON PACKAGING, USA • **CHRIS BAUMAN**, AMERICAN SOCIETY FOR QUALITY, USA • **BO BERGMAN**, CHALMERS UNIVERSITY OF TECHNOLOGY, SWEDEN • **MARCOS E.J. BERTIN**, VOYER INTERNATIONAL, ARGENTINA • **SOREN BISGAARD**, UNIVERSITY OF MASSACHUSETTS – AMHERST, USA • **MAUREEN BISOGNANO**, INSTITUTE FOR HEALTHCARE IMPROVEMENT, USA • **HARRIET BLACK NEMBARD**, PENN STATE UNIVERSITY, USA • **PAUL BORAWSKI**, AMERICAN SOCIETY FOR QUALITY, USA • **CHRIS FELIX BRENDON**, IQS, AUSTRALIA • **MICHELE BRINN**, GREENVILLE CHAMBER OF COMMERCE, USA • **CORNELIA BUTNARU**, RO QUALITY IMS, ROMANIA • **KENNETH E. CASE**, OKLAHOMA STATE UNIVERSITY, USA • **MARIO CASELLINI**, IPACE, ARGENTINA • **ALAIN-MICHEL CHAUVEL**, BUREAU VERITAS, FRANCE • **ENRIQUE CHAVEZ**, GM, MEXICO • **ROBERT COLE**, UNIVERSITY OF CALIFORNIA – BERKELEY, USA • **TITO CONTI**, INTERNATIONAL ACADEMY FOR QUALITY, ITALY • **WILLARD DAGGETT**, INTERNATIONAL CENTER FOR LEADERSHIP IN EDUCATION, USA • **JENS DAHLGAARD**, LINKOPING UNIVERSITY, SWEDEN • **SU MI DAHLGAARD-PARK**, LUNDS UNIVERSITY, SWEDEN • **NAVIN DEDHIA**, QUALITY MANAGEMENT CONSULTANT, USA • **KOSTAS DERVITSIOTIS**, UNIVERSITY OF PIRAEUS, GREECE • **VINCENT DESMOND**, IRCA, UNITED KINGDOM • **RONALD J.M.M. DOES**, UNIVERSITY OF AMSTERDAM, THE NETHERLANDS • **CONNIE FAYLOR**, BEN FRANKLIN TECHNOLOGY PARTNERS, USA • **ARMAND V. FEIGENBAUM**, GENERAL SYSTEMS CO., INC., USA • **BENITO FLORES**, UDEM, MEXICO • **THOMAS FRIEDLI**, TECTEM UNIVERSITY OF ST. GALLEN, SWITZERLAND • **MIFLORA M. GATCHALIAN**, QUALITY PARTNERS CO. LTD., PHILIPPINES • **A. BLANTON GODFREY**, NORTH CAROLINA STATE UNIVERSITY, USA • **HOPE GONZALES**, ABBOTT LABS, USA • **EDUARDO GUARAGNA**, COPESUL – CIA PETROQUIMICA DO SUL AND PGQP, BRAZIL • **YURY GUSAKOV**, EOQ, RUSSIA • **HARRY GUTHRIE**, GENERAL SYSTEMS CO., INC., USA • **HARRY HERTZ**, NIST, USA • **STEVE HOISINGTON**, ELECTRO-MOTIVE DIESELS, INC., USA • **YOUNG-SUN HONG**, KOREAN STANDARDS ASSOCIATION, KOREA • **TOM HOULLIHAN**, USA • **J. STUART HUNTER**, PRINCETON UNIVERSITY, USA • **SPENCER HUTCHENS JR.**, RAM CONSULTING, USA • **YOSHINORI IIZUKA**, THE UNIVERSITY OF TOKYO, JAPAN • **BERTRAND JOUSLIN DE NORAY**, FRANCE • **WOLFGANG KAERKES**, GERMANY SOCIETY FOR QUALITY, GERMANY • **HITOSHI KAMIKUBO**, JUSE, JAPAN • **GOPAL KANJI**, KANJI QUALITY CULTURE LTD., USA • **HESAM AREF KASHFI**, IRANIAN SOCIETY OF QUALITY MANAGERS, IRAN • **PIA KAUMA**, LAATUKESKUS EXCELLENCE FINLAND, FINLAND • **SUZANNE KEELY**, AMERICAN SOCIETY FOR QUALITY, USA • **KAY KENDALL**, SUN MICROSYSTEMS, INC., USA • **HAKAN KILITCIOGLU**, TURKISH SOCIETY FOR QUALITY, TURKEY • **YOSHIO KONDO**, KYOTO UNIVERSITY, JAPAN • **BRIAN LEHOUILIER**, AMERICAN SOCIETY FOR QUALITY, USA • **PAUL LILLRANK**, HELSINKI UNIVERSITY OF TECHNOLOGY, FINLAND • **DAVID LUTHER**, LUTHER QUALITY ASSOCIATES, USA • **ALOIS P. (LOU) MAGRITZER**, AQAC INTERNATIONAL, AUSTRALIA • **PAUL MALEK**, AMERICAN SOCIETY FOR QUALITY, USA • **DAVID MARKWARD**, CEDAR RAPIDS SCHOOL DISTRICT, USA • **MICHELLE MASON**, AMERICAN SOCIETY FOR QUALITY, USA • **MARTIN MERRY**, DYNAMIC HEALTH SYSTEMS, LLC, USA • **PAL MOLNAR**, HNC FOR EOQ, HUNGARY • **DOUGLAS MONTGOMERY**, ARIZONA STATE UNIVERSITY, USA • **LAUREL NELSON-ROWE**, AMERICAN SOCIETY FOR QUALITY, USA • **THONG NGENE GOH**, NATIONAL UNIVERSITY OF SINGAPORE, SINGAPORE • **MIKE NICHOLS**, NICHOLS QUALITY ASSOCIATES, USA • **PAUL O'GRADY**, EXCELLENCE IRELAND QUALITY ASSOCIATION, IRELAND • **CARLOS ORIGEL**, DGETI, MEXICO • **SUNG H. PARK**, SEOUL NATIONAL UNIVERSITY, KOREA • **ALFREDO RODRIGUEZ**, IPACE, ARGENTINA • **ULISES RUIZ**, UNIVERSITY INSTITUTE FOR HEALTH SERVICES ASSESSMENT, IUES, SPAIN • **ROBERTO SACO**, APORIA ADVISORS, USA • **VINOD SAHNEY**, LANDMARK CENTER, USA • **LENNART SANDHOLM**, SANDHOLM ASSOCIATES AB, SWEDEN • **MICHAEL A. SARGENT**, M.A. SARGENT & ASSOCIATES PTY LTD., AUSTRALIA • **JEAN-CLAUDE SAVARD**, J.C. SAVARD CONSULTANTS, CANADA • **BOB SCANLON**, TRANSPORTATION SECURITY ADMINISTRATION, USA • **CHAVA SCHER**, ISRAEL SOCIETY FOR QUALITY, ISRAEL • **HERBERT SCHNAUBER**, RUHR-UNIVERSITAT BOCHUM, GERMANY • **VIKTOR SEITSCHKEK**, QUALITY AUSTRIA, AUSTRIA • **SHOJI SHIBA**, JAPAN • **MADHAV SINHA**, MANITOBA DEPARTMENT OF LABOUR, CANADA • **DAVID SPONG**, USA • **KENNETH S. STEPHENS**, USA • **JOHN STINE**, L-3 COMMUNICATIONS, USA • **HUGO STRACHAN**, AKAPOL, ARGENTINA • **JOAL TEITELBAUM**, PGQP, BRAZIL • **ART TREPANIER**, LOCKHEED MARTIN, USA • **ALBERT TSANG**, THE HONG KONG POLYTECHNIC UNIVERSITY, HONG KONG • **JOE TSIKALS**, THERAVANCE, USA • **ZENAIDA T. VELOSO**, SKILLS & INNOVATION INC., PHILIPPINES • **SAMUEL WANG**, CHUNG YUAN CHRISTIAN UNIVERSITY, TAIWAN • **GREGORY WATSON**, BUSINESS EXCELLENCE SOLUTIONS, LTD., FINLAND • **TADASHI YOSHIZAWA**, TEIKYO UNIVERSITY, JAPAN • **MEHMET YUCEL**, TURKISH SOCIETY FOR QUALITY, TURKEY • **MOHAMED ZAIRI**, EUROPEAN CENTRE FOR TQM, UNITED KINGDOM • **RAY ZIELKE**, AMERICAN SOCIETY FOR QUALITY, USA

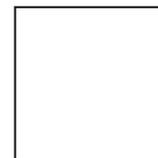
ASQ gratefully acknowledges ASQ's WorldPartners and the many members of the International Academy for Quality whose cooperation and participation made this study possible.

“I’m energized to think that the opportunity for what we do is expanding as humanity’s view of itself and the world expands. Having lived through decades with events ranging from nuclear disasters to putting a man on the moon, I have seen humanity shift its focus from the local to the global—not just in awareness but acceptance of that fact. The concept of global is passé to most every person on the street but the most secluded. And even they are surfing the Web. The concept of social responsibility is also well accepted by most. What is new and exciting is the fact that as a profession, we see this not just as something that is happening around us, but as something we are part of. Something we can impact as much as it impacts us. We have seen in the last decade the passing of a generation of pioneers who by intelligence, charisma, and determination helped make quality more than an ad slogan. Now we see the future of quality and there is so much left to do. How can we motivate the next generation to provide that same intelligence, charisma, and determination to make quality the way we make the world a better place to live?”

*– Mike Nichols
Nichols Quality Associates
ASQ Chair*



600 N. Plankinton Ave.
Milwaukee, WI 53201-3005 USA
t: +1-414-272-8575
800-248-1946
f: +1-414-272-1734
www.asq.org

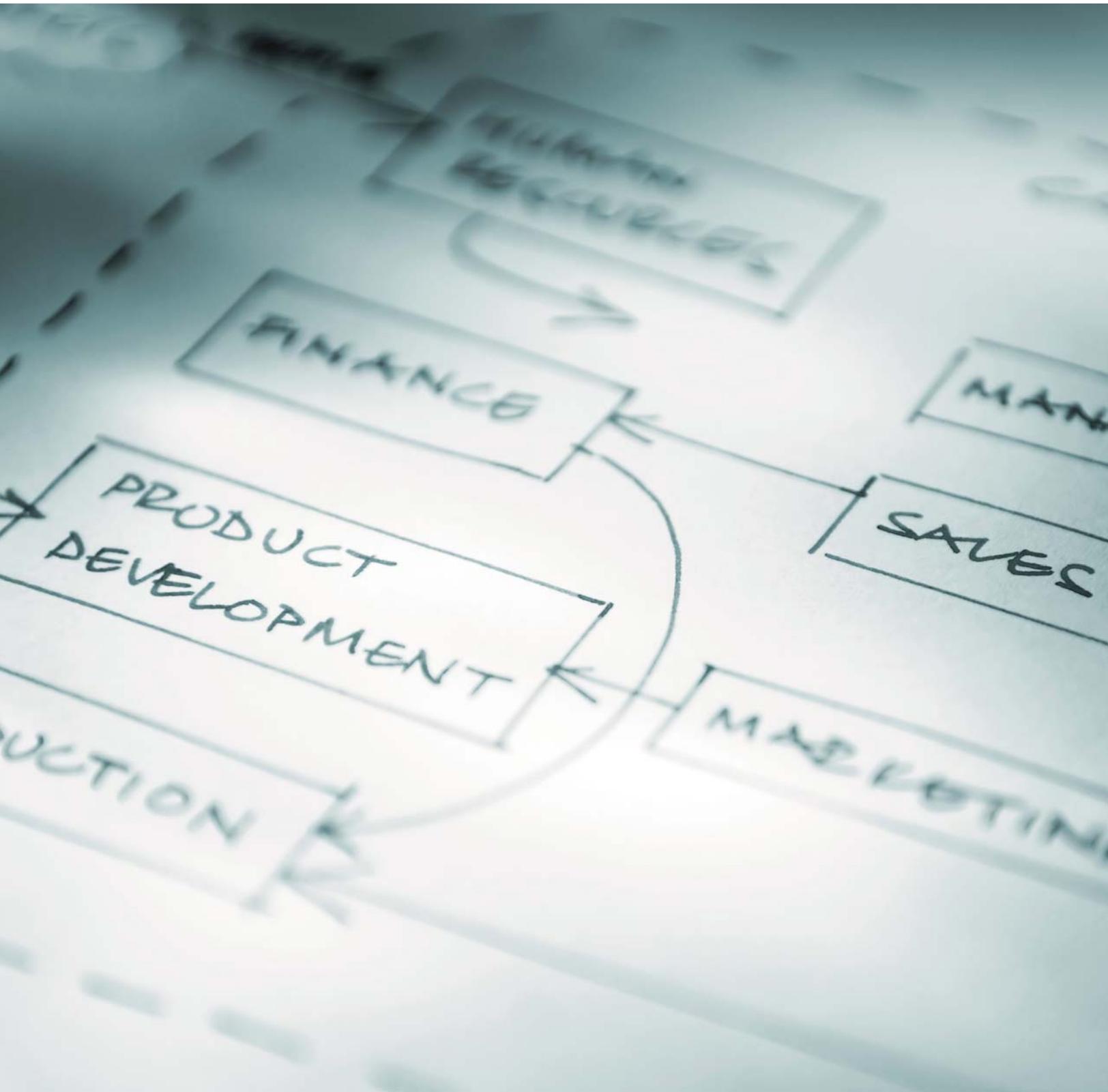




RESEARCH REPORT

A Leadership Prescription for the Future of Quality

A Report from The Conference Board Quality Council



A Leadership Prescription for the Future of Quality

A Report from The Conference Board Quality Council

by Toddi Gutner with Mike Adams

Contents

3	Key Findings
4	Summary: The Importance of Quality across the Organization
4	Having an Impact in Recessionary Times
8	The Quality Quandary
11	Key Trends: Transforming the Future of Quality
11	Globalization
12	Customer Sophistication
12	Talent Management and Leadership Issues: Knowledge Transfer is Critical
14	Environmental Concerns and Social Responsibility
15	How Quality Leaders Meet CEO Challenges
17	Strengthening Quality Practices to Meet Emerging Trends
17	Commit to Strengthen and Build Customer Intelligence
17	Improve Operational Excellence and Speed to Market
17	Build the Next Generation of Customer Advocates
20	The Quality Professional as a Business Leader
20	Become a Catalyst for Change
20	Facilitate Change Management
20	Adopt New Skills
22	Conclusion
23	Glossary of Terms
24	About this Report
24	About the Author
25	The Quality Council
26	Appendix: Survey Results
29	Appendix Table 1: Practices Used To Address Challenges
30	Appendix Table 2: Future Intent with Quality Practices

Key Findings

- Once a critical part of the manufacturing process for more than three decades and transactional processes for two decades, practitioners believe the quality function is now at a crossroads.
- The role of the quality officer is evolving. While many still see their role as one of cost reduction by implementing defect and waste reduction strategies and continuous improvement efforts around satisfying customers, a growing number view themselves as more of a macro-leader, directly connecting their quality practices to business trends and top-line growth. They can be revenue-generators and revenue protectors, as well as cost-cutters—vital roles in holding the line in a down economy while positioning the organization to take advantage of growth opportunities during a recovery.
- Many companies have already moved the quality professional from the back end of managing the production process to the front end including understanding the customer. This is especially true in the services sector.
- While trends of globalization, customer sophistication, talent, and environmental concerns greatly affect the economy, quality practitioners and CEOs surveyed recognize that global economic trends and financial risks add to their views of major challenges which include profitable growth, excellence in execution, customer loyalty and retention, and top-line growth.
- Quality professionals today must commit to strengthen and build customer intelligence, improve operational excellence, systems thinking, and speed to market, and build the next generation of customer advocates. To address these challenges, that are even more critical in a downturn, practitioners need to better use established tools and techniques.
- Today's quality leader needs to avoid these common pitfalls:
 - Emphasizing process over results
 - Misaligning limited resources by working on lower-value items
 - Diluting key measures that drive action aligned to bottom-line results
 - Implementing measures that drive conflicting or bad behavior
 - Delegating quality leadership to departments, leading to lack of responsibility
 - Acting as if quality is a destination rather than a sustaining, cultural norm
 - Dismissing past knowledge versus evolving lessons learned into continuous improvement
 - Deploying quality without context and expectations

Summary: The Importance of Quality across the Organization

Having an Impact in Recessionary Times

What if, with relative minimal investment, your company was able to save between 20 and 30 cents of every dollar it earns or increase revenues or market share by like proportions? This isn't a rhetorical question, but rather the quality leader's job. By eliminating waste—the ineffective and inefficient use of any resource, physical or human—companies save money and improve their bottom line. From quality practices, companies understand what the customer wants and in some cases, anticipate what the customer will want in the future. From that understanding, innovation is born. These are desirable goals of all C-suite executives and stakeholders, especially in a down economy.

U.S. corporations realized these goals when they embraced the teachings and tenets of quality leaders in the 1980s. It was impossible to deny the impressive growth and sustainable success of the Japanese companies that had eagerly instituted quality practices, most notably, in the automobile industry where U.S. companies are faced again with cost and quality issues, if not outright survival, today. With the birth of the Malcolm Baldrige Quality Award in 1987, launched to showcase the best of American management practices, it seemed that the pursuit of quality and its practices had secured a place of merit within corporate America. For a while, the focus of the quality leader and the strategic needs of the business were one and the same: To improve the quality of the enterprise through improved management.

Fast forward twenty-plus years. The dot-com boom, acceleration of technology applications, and double digit growth in the new millennium provided distractions that took the emphasis off the impact of quality to keep pace with market demands. Even though the importance of quality cannot be denied—without it a company cannot remain competitive—there are several trends that are forcing quality practitioners to once again redefine and communicate their value to the business world.

Perhaps most striking is that today, it is no longer enough to have a perfect product or service. “It is an assumed requirement for success in the marketplace,” says Paul E. Borawski, executive director and chief strategy officer of the American Society for Quality (ASQ). What seems to have happened is that quality is so believed to be embedded in corporate processes that, in some cases, it is taken for granted. But the reality is that perfect or near-perfect quality doesn't happen by accident. Instead, companies use complex systems, processes, standards, and continuous improvement tools to achieve their quality goals. It is critical that short-term cost cutting and the dynamics of the economy not divert attention from the contribution that the quality function makes to the long-term sustainability and competitiveness of the organization.

These processes and practices that define the quality professional's role—focusing on the customer, implementing operational effectiveness, and integrating organizational and personal learning into the company's agenda—haven't changed, says Harry Hertz, the director of the Baldrige National Quality Program, an educational outreach program with a presidential award to recognize outstanding achievement. In fact these processes have become more critical in a challenging economic environment.

What else has remained constant are the tools which worked effectively to help U.S. companies regain their competitive edge in the 1980s. Indeed, Philip B. Crosby's mantra “do it right the first time,” Joseph M. Juran's quality trilogy of planning, improvement, and control, W. Edwards Deming's 14-point strategy and problem-solving methodologies (including Six Sigma methods) to reduce defects, waste, costs, and more strongly align to the customers' requirements are still the cornerstone of quality fundamentals today.

Unfortunately some corporate leaders may not be as familiar or experienced with quality metrics and strategies, or worse, having had a negative experience, may not fully appreciate what goes into systematically achieving and maintaining defect-free products and services and enterprise improvement. Consequently, senior executives may not fully appreciate what a quality leader does or how that person can help improve a company's top-line growth and profitability and better position it to seize opportunities during an economic recovery. Unlike the 1980s, when business leaders were hungry for all things quality-related to reduce waste, cut costs, and improve products and customer satisfaction, today's business leaders need convincing. "Some unfavorable impressions today are tied to failures around *how* quality practices were *deployed*, for example, teaching quality tools for tools' sake, rather than the purposeful and timely application of the practices with clear expectations to deliver business results," says Mike Adams, Vice President, Quality for Allegheny Energy, Inc.

Add to that the increased complexity of options quality professionals implement. With nearly 60 years of history and experience, complete with a multitude of different practices from benchmarking and process analysis to re-engineering, change management, and various Six Sigma and problem-solving approaches, it is incredibly challenging for the C-suite executives to stay current and apply these practices collectively as a team. While staying current is challenging enough in their respective functions, the CEO, CFO, CIO, CTO, et al, can accommodate changes due to shifting markets, globalization, and M & A activity by drawing on the skills sets from the quality practitioners for continuity and prioritization.

Even while the fundamentals and foundation of quality remain the same, the environment in which it needs to be implemented has dramatically changed. The world is transforming at a rapidly accelerating pace and the economic environment in 2009 and beyond demands greater agility and speed to market—two factors that speak directly to the role of the quality executive. Take for example, Samsung, which, according to ASQ's Borawski, says that an average product life cycle is now six months. When a product is obsolete in six months, that doesn't leave much time for quality's continuous improvement processes.

W. Edwards Deming's 14-Point Strategy and Problem-Solving Methodologies

1. Create constancy of purpose toward improvement of product and service.
2. Adopt the new philosophy. Management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.
3. Cease dependence on inspection to achieve quality.
4. End the practice of awarding business on the basis of price tag.
5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.
6. Institute training on the job.
7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job.
8. Drive out fear, so that everyone may work effectively for the company.
9. Break down barriers between departments.
10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships.
11. Remove barriers that rob the hourly worker of his right to pride of workmanship.
12. Remove barriers that rob people in management and in engineering of their right to pride of workmanship.
13. Institute a vigorous program of education and self-improvement.
14. Put everybody in the company to work to accomplish the transformation.

Additional challenges facing the quality professional today also come from the impact of four primary trends that affect our economy now and in the future as identified by The Conference Board's Quality Council. These are:

- Globalization
- Customer sophistication
- Talent management and leadership issues
- Environmental concerns and social responsibility

The Quality Council members also revealed in a survey accompanying this report that profitable growth, excellence in execution, customer loyalty and retention, and sustained top-line growth are the major concerns that their CEOs find most pressing.

The ability to address and adapt to those primary trends affecting the economy, as well as showing C-suite executives how the quality tools can be used to address their own concerns and challenges, will mark how well quality leaders will be able to continue to make themselves relevant in the future. One might consider the quality profession at a watershed of sorts.

Survey Highlights: Emerging Trends

In March 2008, The Quality Council surveyed its members on issues relating to the future of quality in corporate America (see Appendix I for survey results). A number of quality industry trends became apparent.

- Perhaps most telling is the Council's response to the current state of the quality function within the organization. Survey results show that in most cases quality is only "somewhat aligned and influential" when addressing business challenges. This highlights the gap between what quality professionals think they can offer the C-suite and what the C-suite expects of them. Clearly, there is room for improvement.
- Of the 35 quality practices identified in the survey, Council members cited most frequently that lean manufacturing tools and techniques will be "accelerated" in the next five to 10 years. Why? To help companies grow in an increasingly globally

In order to respond effectively to such forces of change facing our economy and address the concerns of the C-suite, quality professionals must use their established tools and techniques to meet the following challenges. They need to:

- **Commit to strengthen and build customer intelligence:** Accelerated product obsolescence and more sophisticated consumers make it imperative that companies know what their customer wants with increased speed and accuracy.
- **Improve operational excellence and speed to market:** There was a time that a low-cost product or service was enough for the consumer. Not anymore. Today products and services have to be better, less expensive, and brought to market faster than ever before.
- **Build the next generation of customer advocates:** Companies must focus on engaging the consumer to maintain and increase their loyalty. In a global economy, this requires more emphasis on systems thinking.

Not only must the profession itself adapt, but the quality leader must also change to become a more strategic thinker, skilled in new competencies to address these challenges. To be sure, the quality professional today must "get beyond the tools and become engaged in what is strategically important to the business," says Hertz.

competitive environment, it is more important than ever to minimize waste and maximize the opportunities for flawless execution. Lean tools are used to increase speed and eliminate non-value-added work.

- With regard to the effectiveness of quality practices, the majority of 24 practices identified in the survey that professionals use are considered "extremely effective" or "very effective." With the focus on understanding the voice of the customer, it is no surprise that customer surveys topped the list as an "extremely effective" practice. Interestingly, the Council also noted that linking quality to compensation is "very effective." While customer relationships are an important aspect of the quality discipline, they are a support activity for customer loyalty—the key to protected revenue streams. To that end, it is measurable and effective to tie quality to compensation.

“The only way to bring the talent and the expertise that the quality professions offer and to get the light [and recognition] they deserve is to step out of the quality straight jacket, take a much more holistic view and become engaged in the strategic decision-making process of the business,” adds Hertz.

While some quality leaders would rather not venture out into the challenges that line managers face, it may be that the future of these professionals lies with their own enhanced training and development. “They need to broaden their education and develop themselves in strategic planning,” says Hertz. There is no specific “quality” degree or specialty training similar to that found in other disciplines such as accounting, finance, marketing, or strategic decision making taught through some MBA courses.

Quality leaders today must:

- Be a catalyst for change
- Facilitate change management
- Adopt new skills such as:
 - Understanding how all pieces and processes fit together (Cycle time to improvement; overall systems thinking.)
 - Ensuring that business planning is tied to the company’s bottom line

It is the hope of the Quality Council that the thoughts outlined in this paper address the pressing questions of what is the future of quality and how quality leaders can best adapt to meet that vision.

The Quality Quandary

Quality professionals believe that many, if not most CEOs, think quality is unprepared to adapt to new business and rapid change. The problem: This is only the perception—not the reality. Indeed, examples abound of the profit and sustainable growth companies have enjoyed as a result of effectively implementing different quality practices.

But what fuels that negative perception are the failures and missteps from years past. Many up and coming C-suite leaders will mention previous quality programs that may have been badly designed or implemented and point to them when faced with an opportunity to discuss quality as a useful business planning tool. Take Six Sigma training, for example. “When you train lots of people with green and black belts but the reason for doing it isn’t tied to what is strategically important to the business,” then you have a disconnect, says Baldrige’s Hertz.

These negative perceptions are tough to dislodge. There is also the lack of role clarity and the difficulty in understanding what a quality professional actually does at a company that is a challenge for the profession as well.

Renewing Total Quality at Corning

Corning Incorporated, a \$6.2 billion specialty glass and ceramic company, would not have successfully turned itself around after the 2001 fallout of the fiber optic market without aligning its employees and quality program to the corporate operating priorities. Corning Incorporated experienced a fiber market that saw prices fall more than 50 percent and orders for optical components out of Corning’s photonics division drop 90 percent.

With the return of Jamie Houghton as CEO in April 2002, and subsequently, Wendell Weeks in 2005, the company embarked on a renewal of their 25-year-old Total Quality program. In 2003, the Performance Excellence program was launched as a means of putting “Quality in Action.” The renewed approach aligns improvement and innovation methods directly with the strategic needs of the businesses, while positioning employees and teams to achieve global operational excellence. This way of working tied the quality strategy and tools to the company’s financial objectives.

Another issue makes it tough to position the quality leader for the future; how quality professionals see their own role within the organization. Some see their job as implementing defect and waste reduction strategies, and some quality assurance and process improvement programs, among other more micro-type cost-focused tasks.

Yet a whole host of other quality experts see themselves in more of a macro-leader role. They work directly to connect their quality practices to business trends and top-line growth. “We make the connection with the CEO that we as quality professionals are also business people. We are not only a resource to reduce waste, but one that can also help with balancing cost and quality results and better align efforts to overall business performance, says Allegheny Energy’s Adams.

Throughout Corning’s 50 plants, Performance Excellence drove cost reduction improvements. At one optical fiber plant in Wilmington, NC, one process decreased its downtime by 90 percent, reducing costs nearly \$1 million. In 2007, Corning delivered total cost savings of \$215 million, or more than 3.5 percent of the total revenues. Gross margin hit a record high at 52 percent in Q1 2008, up from 19 percent in 2002 and the company reported record earnings per share of \$1.41. “Quality is not just a mechanism of practices and tools, but a powerful system in which a company can leverage through leadership setting stretch expectations,” says Don McCabe, Senior VP Manufacturing & Performance Excellence.

To be sure, quality has moved upstream from products and services to become an expected part of the customer experience, the overall company, and finally, the community. In the 1950s, the implementation of quality metrics solely targeted the manufacturing processes such as those in the auto industry. By the 1980s and 1990s, those quality practices had moved into the services sectors such as education and healthcare. It is not necessary to differentiate the role of quality in manufacturing and the role of quality in the service industries. The tools and techniques have the same intent but how and when you use them vary based on industry and sector. The practices used are dependent on the business priorities.

Increasingly, the quality function began bumping up against the marketing function and customer relationship management. Good quality became what the customer says it is and not just about a defect-free product. “Quality turned from defect-free to customer focus,” says Borawski of ASQ. So instead of being stuck in the back of the manufacturing process, quality professionals began to use customer and employee surveys and focus groups to get close to the voice of the customer. These tools and techniques grew in importance with the shift toward customer focus.

Mayo Clinic: Saving Lives, Improving Performance

Mayo Clinic started training its staff in the Total Quality Management (TQM) practices of Juran in 1991. “Four years ago leadership began a major effort to refresh and bolster our quality activities, with a portfolio of four energy vectors focused on high reliability: Infrastructure, Culture, Engineering and Execution,” says Dr. Stephen J. Swensen, Mayo Clinic’s Director for Quality.

One engineering effort, for example, was chartered to expedite the treatment of heart attack patients who are best treated with the life-saving intervention of balloon dilatation of the blocked artery to the heart. The process streamlining involved coordination of care between eight different departments and work groups. Door-to-balloon time is the time from patient arrival at the emergency room door to when the balloon is inserted in the artery. During this time the heart attack must be diagnosed with an electrocardiogram and blood work, the expert cardiac team assembled in the hospital, the patient transported, etc.

The goal is to reduce the door-to-balloon time as much as possible because for every 30 minutes of elapsed time before a cardiologist can perform the procedure, the death rate rises approximately 8 percent.

Using Lean and Six Sigma engineering tools, Mayo Clinic was able to reduce the door-to-balloon time substantially, to an average of less than 50 minutes. This was, in part, accomplished by decreasing the number of steps in the process from twelve to four. In U.S. hospitals, only 63 percent of patients have door-to-balloon times of 90 minutes or less.* In 2007 another team successfully worked to spread this best practice throughout Mayo Clinic (which includes 22 hospitals in five states). “This is an iron clad case of where a systematic approach to improving quality practices makes a difference in performance and saves lives,” says Dr. Swensen.

* Nestle, DM, LH Haro, LG Stead et al: Achieving Door-to-Balloon Times of 90 Minutes or Less for ST-Elevation Myocardial Infarction: It Can Be Done! *Annals of Emergency Medicine*, Volume 52, Issue 4, Supplement 1, October 2008, Page S133.

More recently, quality has become a significant factor in companies that focus on customer experience such as the Ritz-Carlton Hotel Company and Starbucks. Many companies, like Allegheny Energy and Milliken & Co. have elevated the role of quality throughout the company.

With negative perceptions, fuzziness of the job specifications, disparity in the expectations of the quality

professional, and the shift of quality practices moving up through the company, is it any wonder that the quality discussion has slipped from the corporate agenda over the last 20 years?

There is a new imperative that quality professionals and the C-suite must recognize to ensure the relevancy of the profession in the coming years.

Table 1

The New Quality Imperative



Source: Mike Adams, Vice President Quality, Allegheny Energy, Inc.

Key Trends: Transforming the Future of Quality

Quality's new dimension requires professionals to go beyond the core skills and practices that were used in the 1980s. They must develop and better use more strategic-thinking skills to adapt to the four key forces of change that are influencing organizational strategies and business results. These trends are:

- Globalization¹
- Customer sophistication
- Talent management and leadership issues
- Environmental concerns and social responsibility

Identified by The Conference Board Quality Council, these trends effectively mirror the seven forces of change that are shaping the future of quality as reported in the 2008 ASQ Futures Study. Interestingly, similar to those defined by the Quality Council, all are examples of forces or trends that are outside the organization or company: 1) Globalization, 2) Social Responsibility, 3) New Dimensions for Quality, 4) Aging Population, 5) Healthcare, 6) Environmental Concern, and 7) 21st Century Technology.

Globalization

The 2008 ASQ Future Study reports that globalization “dominates the future of quality and is the only force that has been listed on each of the previous four ASQ Futures Studies (1996, 1999, 2001, 2005).² Globalization touches every corner of the business world and has far-reaching implications for the quality professional who must manage increasingly global and complex platforms.

It wasn't long ago when companies were vertically integrated to make their products. In this scenario, production materials and talent were location dependent. Factories were located in close proximity to raw materials and the labor force that could operate the machines in the factories. Not anymore. Now, both are sourced on cost effectiveness and increasingly less location dependent. And consumers, once limited to buying from local sources, use the Internet to purchase products and services that best meet their needs.

Of course, managing quality on a global scale means creating new processes and programs to manage every aspect of global production. For example, managing a furniture manufacturing plant in a Chinese province and staffing it with people indigenous to that region will be much more culturally complicated for a U.S. company than if the plant were located in North Carolina.

Not only will the people management aspect be far different but the way in which things are done will differ dramatically. How will decisions be made? Locally or central to U.S. headquarters? What about the quality standards of the inputs that go into the product? Will they meet U.S. or Chinese standards of quality? Does the company train Chinese managers with U.S. strategies? What about the cultural differences between the two nationalities working together?

Of course, none of these questions are new. But, as the world flattens and more consumption comes from the emerging markets outside the United States and Western Europe, globalization requires quality professionals to think in a more innovative and collaborative way.

To survive, much less thrive in this global economy where information travels at lightning speed and consumers increasingly demand more internal and external corporate transparency, collaborative innovation becomes especially critical.

¹ *CEO Challenge 2008: Top 10 Challenges – Financial Crisis Edition*, The Conference Board, Research Report R-1440-08-RR, November 2008. The report features an analysis of the matched sample of responses of 190 CEOs, chairmen, and company presidents who participated in The Conference Board CEO Challenge 2008 survey fielded in July and August, and then took the time to fill out the survey a second time in October, following the recent economic downfall emanating from Wall Street. Global economic performance and financial risk including liquidity, volatility, and credit risk were the fourth and fifth most pressing concerns in the October survey, but were not in the Top 10 list of concerns in the summer survey.

² *The 2008 ASQ Futures Study, The Seven Forces of Change Shaping the Future of Quality*, The American Society for Quality. Available at www.asq.org/knowledge-center/2008-futures-study

In response, “quality leaders must expand the notion of management systems to include global supplier networks,” says Borawski of ASQ. He also suggests that U.S. companies need to become more open-minded about integrating new ideas. “We think that because we do things a certain way and it is good for us, then it must be good for the rest of the world,” he says. And that isn’t always the case. Quality professionals must also create standardized approaches that have cultural flexibilities built into them. In these ways, the quality leader can add value in the global company and economy. And quality professionals need to keep open minds for innovations that can, and will, surface anywhere in the world.

Customer Sophistication

Quality professionals are uniquely poised to take advantage of the increasing consumer expectations that require near perfect quality as the minimum entry point into the marketplace for any product or service. Why? Because understanding who the customer is and what he or she wants is an area of expertise in which quality leaders are already skilled and can easily provide to top company executives. Quality tools such as benchmarking, quality function deployment, and customer surveys are readily available and get the information that companies need to stay close to their consumers.

In fact, many companies, such as the Ritz-Carlton Hotel Company, have moved the quality professional from the back end of managing production processes to the front end of understanding the customer and then designing and providing a unique consumer experience. It is that custom-built, one-of-a-kind experience that will reign supreme in the marketplace and provide the experience differentiation that will instill brand loyalty among customers.

Talent Management and Leadership Issues: Knowledge Transfer is Critical

Baby boomers aren’t going anywhere soon, but they are aging. Currently, one-quarter of older adults aged 60 and up are in the labor force and that percentage is only expected to rise, according to the American Council on Education.

But the aging population isn’t just a U.S. phenomenon; it is taking place in such diverse geographies as Europe and Asia as well. That means up-and-coming leadership talent worldwide will likely be in short supply and a battle for the best and the brightest will continue.

So what is the connection between talent management and leadership issues to the quality function’s role? One critical aspect is knowledge transfer within an organization. While the knowledge of individuals on the job is essential to get the work done most companies still have no plan for the management and transfer of knowledge, and even fewer factor cross-generational challenges into business strategy.³ The best way to efficiently transfer knowledge is by developing effective knowledge transfer processes—a quality professional’s expertise.

In organizations, effective and sustainable knowledge transfer is complex, and involves the development of continuous and dynamic processes. It is imperative to make knowledge reside in the process and not in a single person. To that end, it is incumbent upon the organization to insure that the institutional memory, the experience and knowledge of longtime executives that is unique to an organization is effectively transferred to the new leaders. Not all knowledge, of course, has equal value, so it is also critical to understand exactly what information needs to be imparted. For the first time in history, four generations are working side by side in organizations. How exactly does this play out?

Consider the email etiquette between a leading baby boomer (60-plus) and a Gen Yer (born after 1980). The former carefully constructs a polite message complete with proper introduction and salutation while the latter often uses phrases such as “C U later” to convey his or her salutation with equally cryptic words throughout the message. This difference in the way employees communicate as well as the way in which they work—Gen Yers don’t necessarily value where work is done, only that it gets done—raises significant quality control issues. Quality professionals need to help provide answers to questions such as: How can quality processes and metrics be implemented and employees fully engaged among a far-flung workforce with many individuals in a location of their own choice?

³ *Bridging the Gaps How to Transfer Knowledge in Today’s Multigenerational Workplace*, The Conference Board, Research Report R-1428-08-RR, July 2008.

Being Customer-centric at the Ritz

The Ritz-Carlton Hotel Company focuses on delivering excellent service among a very diverse population. While all their customers may be in the same financial class, they all want to be treated differently. A family man may want all the attention paid to his children, while a professional businesswoman may prefer to have her mini bar stocked with caffeine-free soda rather than regular soda products prior to her arrival. “Part of creating a customer-centric culture is treating the customer the way they see themselves,” says John Timmerman, VP of operations for Ritz Carlton’s 75 hotels worldwide.

To achieve that goal, the company conducts monthly, quarterly, and annual surveys using the Baldrige-based systematic benchmarking surveys. These are one of the many tools the company uses to ensure its extremely high level of customer engagement scores. Indeed, Ritz-Carlton rated in the 91st percentile in customer engagement against the Gallup Organization database.*

Among the dozens of quality practices used throughout the company, each employee attends a mandatory two-day orientation when hired and then annual re-certification thereafter. Senior leaders attend monthly performance reviews which carry the same importance as sales and financial goals. The company also links incentive compensation to employee, customer, and financial performance.

Within the hotels, each employee from housekeeping to the front desk has an automatic authority to spend \$2,000 to solve a customer problem—no questions asked. Another practice is to provide ongoing training to hotel employees to study customer behavior and record guest preferences and problems in a company database. If a customer prefers feather pillows, or eats all the apples in the fruit basket provided in the room, those observations are recorded so that the next time that guest arrives at any Ritz Carlton hotel, he or she will receive feather pillows and extra apples without asking.

In addition, each of the company’s 40,000 employees has a mandatory daily 15-minute meeting with department colleagues prior to the work day. In the brief meeting, the employees and the department’s strengths, weaknesses, opportunities, and threats (SWOT) are reviewed. Every day, each team reviews one of the company’s 12 service value steps of quality (which everyone carries listed on a card) and discusses efforts of an employee who has done something exemplary to satisfy a customer. These stories, called WOW stories, are published and reported throughout the company. “When it comes to customers, feelings are facts we have to manage,” says Simon Cooper, the president of Ritz Carlton.

It is such attention to customer feelings that has brought the Ritz-Carlton Hotel Company a number of awards, including the Luxury Institute’s #1 rating for the best customer experience, Consumer Reports number 1-ranked luxury hotel in all areas (value, service, upkeep and problem resolution) and a number 1 ranking in JD Power’s GSI 2007 and 2008 Study, among other awards.

WOW STORY OF THE YEAR

The Ritz-Carlton, Buckhead

One WOW story comes from The Ritz-Carlton, Buckhead in Georgia and is an innovative example of how we can all enliven Service Value No. 6—“I own and immediately resolve guest problems.” A couple and their son booked a weekend stay at the hotel. During their visit, their son was in awe of all of the tour buses that line up outside of the hotel during the busy summer entertainment season.

The family had a great stay, but when they checked out of the room and left the hotel, they discovered that their son had misplaced his favorite stuffed bear, “Sting,” that he made at the retail store Build-A-Bear. The couple called the hotel’s Manager on Duty to report the missing bear. Hope Nudelman, Director of Meetings and Special Events, and the Manager on Duty searched every department for the bear, but the stuffed animal was nowhere to be found. Hope went to the hotel’s retail shop to see if she could find a similar bear, but none of them matched. Hope promised the guests that she would continue looking for the bear.

She never found it, but decided to take it upon herself to resolve the situation. So, she drove 45 minutes to the nearest Build-A-Bear store, and made the young guest a new “Sting.” She even bought a guitar for the bear since the child loves music. She sent the new stuffed animal to the guest’s home with the following note:

Dear (guest’s name),

I am sorry I ran away from you. I saw the tour buses outside of the hotel and I wanted to see what it was like to be at a concert. I had a great time. The lead singer even gave me this guitar. I hope you were not worried. Next time I will call home. While I was away, I met this really nice lady and she helped me get home. She gave me a bath and now I am nice and clean. I feel brand new—in fact, I even look it. I missed you and I am glad I am home.

— *Sting*

So first class to Hope for working tirelessly to satisfy a guest! We can all look for unique, personal ways to engage our guests. If we do so, we’ll enliven The Ritz-Carlton Mystique and create a situation where guests “simply can’t imagine a world without Ritz-Carlton.”

* Gallup is a well-known and respected source of third-party research. 90th percentile is usually considered best-in-class for a multiple location (e.g., chain) in performance level (higher level for a single unit).

Source: John Timmerman, VP, Operations, Ritz-Carlton Hotel Company.

Environmental Concerns and Social Responsibility

Environmental concerns are part of the larger trend toward corporate social responsibility. The well-known adage—*doing well by doing good*—is becoming an imperative for all organizations to incorporate in their business plan. It's not just good citizenship, it's good business that drives bottom-line results. Indeed, consumers are requiring companies take protective action to save our planet if they are to buy their products and services. This all-encompassing mandate starts from the call for increasing the amounts of recycled materials as inputs into production and reducing the amount of energy used to produce a product to decreasing corporate carbon footprints and implementing “green innovation” techniques.

As consumers insist on more transparency in corporate practices, they will increasingly use this information to make purchasing decisions. Quality leaders are the linchpin in giving the customers what they want. They can provide the tools, techniques, and processes to companies to help them meet the increasing standards that consumers require. If management decides on an environmental goal to meet, quality professionals can engineer a system to reach that goal and measure the results. Management systems like the ISO 14000, the environmental management systems standard, can help achieve those goals.

How Quality Leaders Meet CEO Challenges

Aside from the global forces of change that every industry must address, there are certain challenges that are specific to senior leadership. Each year, business leaders from around the world identify their most critical concerns in The Conference Board CEO Challenge. In the most recent 2008 edition, the top 10 challenges that CEOs cited in a souring economy included Excellence in Execution, Consistent Execution of Strategy (by top management), Sustained and Steady Top-Line Growth, Customer Loyalty and Retention, and Profit Growth, among others.⁴

The Quality Council also surveyed its own members and asked what their CEOs found to be relevant issues to the long-term success of their organizations. Similar to the CEO Challenge, the Council found that Profitable Growth, Excellence in Execution, Customer Loyalty and Retention, and Sustained/Steady Top Line Growth were among the top concerns of their senior executives.

With these challenges keeping CEOs up at night, it is the aim of the quality professional to show senior management that they have just the practices, tools, and techniques that the senior leaders need to address these concerns. They range from statistical tools and applications to broader systems and cultural issues. “Currently, the C-suite may not be fluent nor necessarily need to know many of the quality practitioners’ tools and therefore may not connect the organizations’ bench strength in these quality skills and competencies with its business performance,” says Allegheny Energy’s Adams.

Given the concerns of senior management, it is clear that the following quality tools and practices can and should be used to achieve strategic business results.

Profitable Growth Obtaining and maintaining profitable growth is a known result of implementing quality practices. Quality approaches have impact on both increased revenue and reduced cost. Both deliver profit. When quality is high, customer satisfaction is assured, and loyalty goes up. Wowed customers tell others. And products well designed to respond to customer needs are welcomed in the marketplace. When companies squeeze out costs, reduce waste and defects, the benefits are clear: Increased profitable growth. Lean, Six Sigma and various

combinations are two of the more popular tools that quality practitioners use to accomplish continuous improvement which ultimately leads to profitable growth. And increasingly companies are looking to quality management practices to reduce the risk of catastrophic events that can virtually wipe out a company’s profits.

Excellence in Execution One of the traditional skills of a quality leader is to be able to know how to put standard systems in place, how to measure against that system and how to improve the performance over time. To do that, quality leaders use several tools such as process management, benchmarking, balanced scorecard, root cause analysis and systematic improvement to be able to align business processes with results. If a company is going to have a strategy that beats the competition, then that organization needs to know who is better and how they do it; that’s benchmarking and quality leaders know how to capture that data.

Customer Loyalty and Retention Knowing what the customer wants is a basic hallmark for which a quality professional is known. It only follows that when a customer gets what he wants, he is more likely to buy the product or use the service. Loyalty and thus retention become a more likely outcome. Moreover, satisfied customers tell others, and word of mouth marketing is hard to beat. Quality professionals make it their business to focus on the customer and use tools such as benchmarking, customer surveys, and customer metrics to keep their finger on the pulse of what will keep the customer happy and ensure that the customer is linked to processes that use this input.

Top-Line Growth When senior executive teams think of how quality professionals can help them, they usually go straight to the cost-cutting side of the equation. While that of course helps to increase profits, there is the other side of the equation, to build revenue as well as protect revenue streams. The quality practitioners’ skills are often overlooked in the process. Because the quality leader knows what the customer wants through tools such as surveys, he is in an excellent position to acquire more customers for the company as well as increased dollars from existing customers.

⁴ CEO Challenge 2008 Top 10 Challenges—Financial Crisis Edition, p. 5.

Innovative Quality Management at Milliken & Company

Ten years ago, there were nine textile companies with more than \$1 billion worth of business. Today, there is one—Milliken & Company. Their dedication to quality in production, along with innovation excellence, are at the foundation of the company's ability to survive and even thrive in today's global competitive marketplace. Such focus on quality has brought the company both a Malcolm Baldrige National Quality Award and the Japanese Total Productive Maintenance Excellence Award, the only company in the world to win both.

What is Milliken's secret? The company has created a proprietary daily management system, called Milliken Performance Solutions (MPS) that provides common language, processes, and goals that everyone throughout all plants in a company follow. This allows a company to transfer employees and managers between plants. With approximately 40 physical locations in the United States and more than 11 locations internationally, the ability to do the same work more effectively and efficiently is a competitive advantage.

To that end, Milliken's MPS has had real financial results. For example, in 2007 at one of the company's U.S. plants, there was *one* breakdown among 160 machines (with an estimated age of 25 years old and run time of 6.5 days per week). Compare that

with 2001, just before the company implemented MPS, when the same plant had *10-12* breakdowns per week. Consider some of these additional improvements at that same plant between 1995 and 2007: Fixed cost per unit fell by 83 percent; defects reduced by 93 percent; number of associates and managers fell by 44 percent and 48 percent, respectively.

This plant is just one example. Company-wide, between 1999 and 2007, Milliken & Co. reduced internal defects by 60 percent; external claims fell by more than 40 percent and process reliability improved by 30 percent. In 2007, the company completed more than 1,500 individual projects with an average savings per project of \$20,000; this is a typical year-over-year improvement since 1999. What's more, Milliken has increased its return on invested capital more than 40 percent. "With MPS in place, I don't have to drive quality on a day-to-day basis as management typically has to do," says Joe Salley, CEO of Milliken & Co. "I have more of my time freed up to work with the strategic positioning of the company."

It is such financial results that prompted Milliken to establish a new consulting group, Milliken Performance Solutions, in 2007 which aims to help other companies improve quality and safety.

Strengthening Quality Practices to Meet Emerging Trends

Quality practitioners need to use their well-established practices and tools to meet the challenges facing senior leadership today, but there are areas in which companies and the quality professional must do better than they have done in the past. The challenge of the quality leader is to be able to commit to strengthen and build customer intelligence, improve operational excellence and speed to market, and finally, build the next generation of customer advocates—all critical issues to survive in a down economy and to be poised to take advantage of new opportunities presented by a turnaround.

Commit to Strengthen and Build Customer Intelligence

In today's global economy where resources are scarce and product life cycles are getting shorter and shorter, "companies can't afford to be wrong often," says Borawski of ASQ. With continual mistakes, such as misjudging what the consumer wants, resulting in a failed product or service launch, a company won't survive. "Whoever gets it right first is going to win the lion's share in the marketplace," he says.

A traditional strength of the quality profession is to understand the customer and translate that information into requirements for a product or service and then measure performance against those requirements. In the global economy, markets and customers are much more diverse with a wider spectrum of requirements, needs, and wants.

Improve Operational Excellence and Speed to Market

When executives think of the quality department, they immediately think of the ability of this discipline to continuously improve the manufacturing of a product or the delivery of a service. But achieving these results is no longer enough. The enterprise must be more agile, leaner, more efficient, and faster than ever before.

Indeed, in today's state of mass customization, quick capture, analysis, understanding, and acting on customer intelligence are key to rapid fire improvements and delivery to market. Add to that the customization dimensions necessary for cultural, language, and infrastructure issues and the result is increased complexity. Random management practices in these environments are dangerous—system approaches, system measurements, and systematic process management are critical to successfully tackling such complexity and bringing solutions into focus.

Build the Next Generation of Customer Advocates

Many of the original quality leaders have either retired or have senior business leaders who may not truly understand the value of basic quality principles and practices. Some organizations may assume these principles and practices are already in place. This may be because these new executives have fragmented exposure to and understanding of the tenets of quality or because of weak communication as to the value quality brings to business.

The truth is, in many companies it is "the quality professional who reminds everyone else that the purpose of the business is to satisfy the customer," says Borawski. At one business strategy meeting he attended at a Fortune 100 company, there were 1,000 post-it notes on a wall. "Not one had the word customer printed on it," he says. The quality professional in the meeting pointed out that oversight.

The quality leader is the voice of the customer. To be able to preserve the quality culture, it is imperative to involve all employees in the quality practice not just the practitioners themselves.

Cisco Systems: Quality Starts at the Top

Cisco Systems is a good example of a company that is committed to strengthening and building its customer intelligence. In fact, Cisco won The Data Warehousing Institute's Best Practices Award for 2008 in the area of customer intelligence. This award is designed to identify and honor companies that have demonstrated excellence in developing, deploying, and maintaining business intelligence and data warehousing applications. To that end, Cisco Systems uses this customer-centric information to attract, enhance, and improve customer relationships.

Cisco Systems starts at the top where CEO and Chairman John Chambers still spends 60 percent of his time in front of customers. "Listening is as important now as it was at our inception," says Chambers. "There is a market transition taking place today that is driven by consumer participation, innovation, collaboration, and social networking—all of which are the result of an increasingly empowered and informed customer. This transition is driving what we refer to as Cisco 3.0. This is our ability to listen to and collaborate with our customers in order to take customer intimacy to an entirely new level. To anticipate our customers' needs in the future, we will have to listen, respond, and adjust to feedback like never before," says Chambers. The leadership is backed up with process and practices such as an annual customer satisfaction survey that Cisco has deployed for the last 14 years.

This annual survey, which is at the heart of company's intelligence strategy, gathers feedback from all Cisco customers with some 100,000 responses from all markets and geographies. The survey process is ongoing through the year which allows the company to continually gather fresh data and achieve better alignment to quarterly reporting periods. Not only does Cisco engage their sales team and partners in the process, but they also link customer satisfaction to the variable compensation for all employees including executives (excludes sales). This reinforces the message that "the customer gets to vote." Indeed, by setting clear targets and tying them back to compensation Cisco has seen consistent improvement in its customer satisfaction scores.

Once all the data is collected, Cisco Systems is able to segment and analyze the feedback from customers and then partners with Walker Information, a consulting firm, and use regression analysis to determine what matters most to customers. Information is integrated into the company's business process to give employees just-in-time information so they are able to use the data in their everyday decisions.

One example of the company-wide satisfaction programs in place is the *Low-Score Follow-Up Program*. If a customer turns in a low satisfaction score, a Cisco employee has 21 days to make contact with that customer. All information is captured on an online system which is extremely useful when it comes to ease of use, visibility, and accountability. The online system allows the company to drill down on key issues such as why the customer is dissatisfied, what attributes of the product are causing most difficulty, how long the user has been working with the product, and suggestions on how to improve from the customer. After three years of using the *Low-Score Follow-Up Program*, it is considered one of the most valued programs in the field. Research shows that if a customer has a low follow-up score in year one, the company sees an increase in loyalty of 16 percent in year two, and in some geographies a 29 percent improvement in loyalty measured by repurchasing patterns.*

So how does loyalty translate into bottom line growth? Cisco has developed data models to link loyalty to financial outcomes. They found that a 10 percent increase in loyalty equals a 4.4 percent increase in revenue.

* Cisco measures loyalty based on a model provided by Walker Information, a research vendor. It is an index based on derived importance of both attitudinal and behavioral commitment to Cisco. The following is a step-by-step process of how Cisco measures loyalty: 1) In year 1—if a customer registers a low score, which qualifies for customer to be followed according to the company business rules, then the record is flagged for a follow-up; 2) All flagged records are noted so that Cisco can compare customer's starting loyalty; 3) The record is dispatched for follow-up via email notification and tracked via a web tool; 4) The account/service team conducts the actual follow up and actions documented on a web tool; 5) Year 2: Customer is re-invited to annual CSAT Survey process; 6) If a reply is provided, we compare loyalty of Year 1 vs. loyalty in Year 2. Since Cisco categorizes by geography and market segment, the company can categorize program performance by these segments.

Speed to Market at Johnson & Johnson

Johnson & Johnson (J&J), the \$63.7 billion (2008 revenues) global health care products company, is meeting the complex challenges of improving operational excellence and speed to market. With more than 250 operating companies and 120,200 employees in 57 countries, improving operational excellence is a tall order. But using quality improvement methods [known as Process Excellence] throughout J & J franchises helps the company significantly reduce its new product development cycle times and thereby accelerates speed to market.

For example, Ethicon Endo-Surgery, a J&J company that develops and markets advanced medical devices for minimally invasive and open surgical procedures, had insufficient capacity to meet strategic planning needs for new products. The operation was also plagued by a great deal of rework and unnecessary steps. There was also the need to improve how the voice of the customer fit into the development process. Once the J & J Process Excellence

tools and methods were employed, Ethicon Endo-Surgery slashed its new product development time by approximately one year.

As a result, it saw a 60 percent reduction in new product cycle time and a 45 percent increase in new product capacity. This led to nine additional product launches, \$25 million in avoided headcount cost and \$211 million in incremental revenue over the two-year period between 2004 and 2005. "Our efforts around quality, or process excellence, have evolved with the business," said Dominic Caruso, Vice President, Finance, and Chief Financial Officer, Johnson & Johnson. "These programs are not simply about achieving cost-savings. They must make our businesses stronger and enable us to create value for our shareholders. Our franchises' efforts are having an impact on the bottom line with reduced development cycle times, more efficient product launches, and increased customer satisfaction," he says.

The Quality Professional as a Business Leader

Not only must the quality professionals' role in the organization change if their function is going to be relevant in the coming years, but they will also need to acquire new skills if they wish to help guide their corporation through these tumultuous times.

Become a Catalyst for Change

For quality leaders to support the increasingly complex organizational challenges, they must be an "outside insider." In other words, they must be able to command the prerequisite skills and competencies of the original quality leader, and be aware of more than what is going on in the quality department alone. They must see the big picture, organizationally. To that end, they need to think strategically and be proactive in areas where change is necessary.

Facilitate Change Management

Not only must the new quality leaders be a catalyst for change, but because they are an expert in the change process they must be the facilitator of those changes. "Better may not be enough in a world of rapid change. Transformation may be required," says Borawski who argues that in some cases, in order to survive a company might have to transform into something entirely different from what it had been.

Additionally, quality professionals must improve upon their own practices. To that end, they must harness new ways of collecting customer feedback and use it effectively to drive business improvement, work toward upgrading the business in complex environments where collaboration, virtual teams, and alignment are much more challenging; and finally be more influential among senior leadership.

Adopt New Skills

Whether or not a quality professional wants to actually move into the executive ranks, it is imperative that he or she take a more holistic view of the quality function and understands how all pieces and processes fit together in. To improve components, the entire system needs to be considered.

Another critical skill that must be acquired is the ability to ensure that business planning is tied to the company's bottom line and top-line growth. In the past, quality professionals had been guilty of not relating processes and practices to the company's strategic direction. While it is known that the quality department can help increase profit and revenue through reducing waste, cycle time, and understanding the customer, quality professionals don't always make the connection to the overall strategic direction of the business.

Finally, today's quality leader must learn from failures or missteps of the past and ensure the executive leadership team adopts practices that embed criteria for success:

- Emphasizing organizational results over process
- Aligning limited resources by working on highest value items
- Accurately translating customers needs and supporting requirements and delivery processes
- Elevating key measures that drive action aligned to bottom line results
- Implementing measures that drive behaviors aligned to customers and profitability
- Embedding quality accountabilities and responsibilities into executive leadership
- Recognize that quality practices evolve dynamically with the market and organizations' priorities
- Evolving lessons learned into continuous improvement
- Deploying quality with context, expectations, and follow up

Manage-by-Fact Mindset at Allegheny Energy

Allegheny Energy, Inc., a \$3 billion electric utility with approximately 4,500 employees, was on the brink of bankruptcy in 2003, caught up in the deregulated trading business frenzy that followed Enron-like acquisitions.

Paul Evanson, Chairman, President and CEO and former president of Florida Power & Light, took over the challenged company with the aim of overcoming the short-term financial troubles and also transforming the company into a high-performance organization. Having come from a company with high-quality skills and realizing best-in-class results, expecting increased quality at decreased costs was a given.

Paul brought quality leadership into the executive ranks of the organization to give the leadership and employees a “manage-by-fact mindset” and a robust operating discipline.

“We have just one person purposefully leading the quality effort to ensure it is driven by the business. He works closely with the leadership team to inculcate quality thinking and rigor into their plans. There are support systems to execute the plans to achieve expected results in areas of safety, financials, customer sat, operational excellence, environmental, and employees,” explains Evanson.

Allegheny’s focus on safety has resulted in a 60 percent reduction in injuries overall with an 80 percent improvement in its transmission and distribution business that elevated the company to first quartile performance. This was accomplished project by project, addressing root cause by root cause with field personnel who delivered results such as reducing dog bites by 62 percent,

slips, trips and falls by 50 percent, and repeat injured people by 65 percent. While the goal is to have a zero injury work environment, an additional outcome of these teams has been a savings of workers’ compensation costs of near \$1 million to contribute to a portfolio of efforts to reduce costs.

With an over 41 percent reduction in O & M expenses since 2004, external customer satisfaction remains in the upper quartile from surveys of both the American Customer Satisfaction Index and TQS Research, a company that specializes in business-to-business research among the largest energy users in the United States and Canada. Internal customers’ satisfaction from an annual employee engagement survey reflects year-over-year improvement.

Operational excellence improvements are targeted at reducing forced outages at the power plants (down 31 percent) and improving the cycle time, the time it takes to bring them back on line when they go down, by 35 percent.

While Allegheny uses many of the traditional quality tools and Six Sigma as its basic problem solving methodology, it implements systematic improvement efforts with concentration on careful project selection, business alignment to the balanced scorecard, and just-in-time training of appropriate analytical tools and techniques to solve the problem and deliver timely results. This technical training supplements training on leadership, change management, project management and performance management, all necessary for sustainable results.

Conclusion

The quality executive is a revenue-generator and revenue protector, as well as a cost-cutter—vital roles in holding the line in a down economy while positioning the organization to take advantage of growth opportunities during a recovery.

Ideally, business and organizational leaders must naturally apply quality tools and techniques to drive their business. The customer demands it. A culture must be created where the tenets of quality are embedded in the organization's

DNA and that they are designed to meet the business challenges while delivering predictable, sustainable business results in good economic times and in bad. To achieve these goals, quality professionals must continue to acquire skills that allow them to become strategic business partners to their company's senior leadership team. The result: More engaged employees, more loyal customers, better bottom line performance, and improved top-line growth.

Glossary of Terms

Balanced Scorecard: A management system that provides feedback on both internal business processes and external outcomes to continuously improve strategic performance and results.

Benchmarking: A technique in which a company measures its performance against that of best in class companies, determines how those companies achieved their performance levels and uses the information to improve its own performance. Subjects that can be benchmarked include strategies, operations, and processes.

Change Management: Organized, systematic application of knowledge, tools and resources of change that provides organizations with a key process to achieve their business strategy.

Customer Metrics: Measures of customer satisfaction, value, and loyalty.

ISO 14000: An international environmental management standard that ensures all operational processes are consistent and effective and will achieve the stated environmental objectives of an organization.

Lean Six Sigma: A methodology that maximizes shareholder value by achieving the fastest rate of improvement

in customer satisfaction, cost, quality, process speed, and invested capital. The fusion of Lean and Six Sigma is required because Lean cannot bring a process under statistical control and Six Sigma alone cannot dramatically improve process speed or reduce invested capital.

Process Analysis: Quantifying the process capability from data.

Re-engineering: A breakthrough approach for restructuring an entire organization and its processes.

Root Cause Analysis: A breakdown of a factor that caused a nonconformance and should be permanently eliminated through process improvement.

Six Sigma: A method that provides organizations tools to improve the capability of their business processes. This increase in performance and decrease in process variation lead to defect reduction and improvement in profits, employee morale and quality of products or services. Six Sigma quality is a term generally used to indicate a process is well controlled.

Systematic Improvement: A philosophy or attitude for analyzing capabilities and processes and improving them repeatedly to achieve customer satisfaction.

Source: American Society of Quality; Quality Glossary, June 2007.

About This Report

The information contained in this report is the result of an intensive day and a half working session of the The Conference Board's Quality Council. In preparation for this session, the 17 members of the US Quality Council were asked to answer a 12-question survey. (Appendix I and II). During the working session, the Council members used results from this survey as a springboard, shaping the paper through rigorous discussion.

About the Author

Toddi Gutner is an award-winning business journalist who has covered the financial markets, retirement, career and small business issues for *Businessweek* and *Forbes* magazines since 1990. She is currently a contributing writer for the *Wall Street Journal* and continues to write, both in print and online for several other business publications including *Businessweek*. Prior to becoming a journalist, Ms. Gutner was an economic analyst at a private consulting firm in Washington, D.C.

Ms. Gutner wrote this report with the help and guidance of **Mike Adams**, co-chair of the Quality Council of The Conference Board, is vice president, quality of Allegheny Energy. His experiences range from unit advisor to Florida Power & Light in receiving the Deming Prize in 1989, the first non-Japanese company to be awarded the prize, ASQ senior member, previous Baldrige Foundation Director, Baldrige examiner, USA Today/RIT Quality Cup judge, and previous director of global performance excellence for Microsoft.

The Quality Council

The Quality Council of The Conference Board is comprised of executives from companies known to be leaders in performance excellence and quality. Member firms come from a broad range of industries representing multiple sectors aligned to the Baldrige categories. The forum provides a means to transfer information and share insights and practices for the benefit of the members and their organizations. Quality Council members who contributed to this report include:

Mr. Mike Adams

Vice President, Quality
Allegheny Energy, Inc.

Mr. Lloyd O. Barker

Director of Corporate Quality
Alcoa

Ms. Janet Crutchfield

Senior Corporate Director of Quality
The Ritz-Carlton Hotel Company, L.L.C.

Mr. Kirby Drysen

Senior Director, Corporate Quality
Cisco Systems, Inc.

Ms. D. Jane Farthing

Managing Director, Connected Thinking for Excellence
PricewaterhouseCoopers LLP

Mr. Anre Garrett

Staff Director, Enterprise Quality
FedEx Corporation

Mr. Hiten Ghosh

Vice President, Chief Quality Officer
Hughes Network Systems

Ms. Mary Griep

Director, Lean Six Sigma Quality Operations
3M Company

Ms. Janet M. Hinman

Director, Corporate Quality
Corning Incorporated

Mr. Michael J. Jesrani (Mike)

Director
Quality Management Process
Corporate Headquarters
IBM Corporation

Mr. S. Craig Long

Vice President, Milliken Performance Solutions
Milliken & Company

Mr. George Maszie

Director, Corporate Lean Six Sigma Operations
Xerox Corporation (retired)

Mr. William B. McBee

Vice President, Total Customer Experience & Quality
Technology Systems Group
Hewlett-Packard

Mr. Karl F. Schmidt

Vice President, Business Improvement Services
Johnson & Johnson

Ms. Cassie Stern

Vice President, Customer Care - North America
Nokia Inc.

Mr. Stephen J. Swensen, M.D. (Steve)

Director for Quality
Mayo Clinic

Mr. John Timmerman

Vice President of Quality and Program Management
Ritz-Carlton Hotel Company

New Members:

Mr. Chuck Chada

Vice President, Strategic Initiatives
Corporate Lean Six Sigma Operations
Xerox Corporation

Ms. Teri Ivaniszyn

Director of Operational Excellence for Strategy
and Business Process Improvement
FPL Group

Mr. John Sicilia (JD)

DoD CPI Deployment Director
DUSD-Business Transformation
Office of the Secretary of Defense

From The Conference Board:

Ms. Cindy Moy

Council Coordinator
The Conference Board

Mr. Robert M. Parent

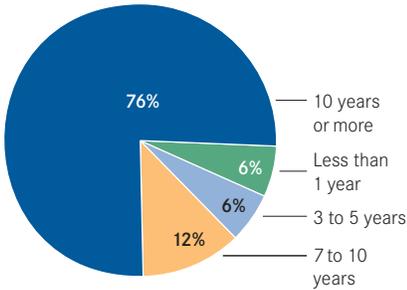
Council Program Director
The Conference Board

Appendix: Survey Results

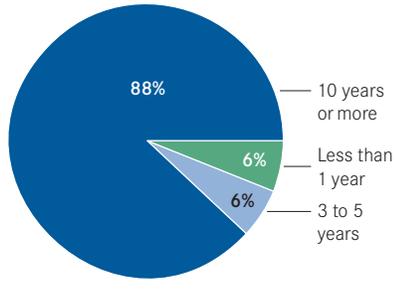
Demographics

Most council members have extensive experience in the Quality field.

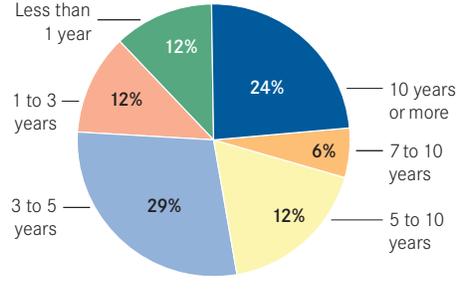
Time with Current Company



Total Years as Quality Professional



Time in Current Role

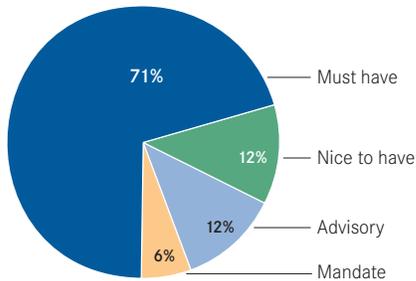


Number of responses = 17

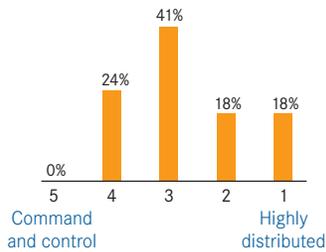
Business Environment: Senior Management

Most believe Senior Management views Quality as a "Must Have" in their organization.

Senior Management's View of Quality's Role



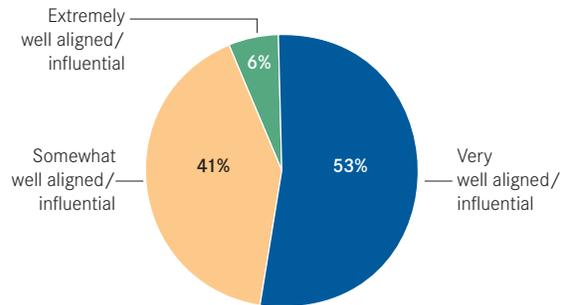
Senior Management's Leadership and Decision-making Style



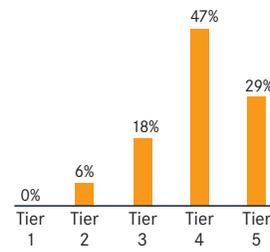
Number of responses = 17
Data shown is the percent mentioned.

Business Environment: Quality's Influence

Quality is "very well" or "somewhat" aligned and influential when addressing business challenges, corresponding with the quality maturity level most organizations indicate achieving.



Quality's Maturity Level



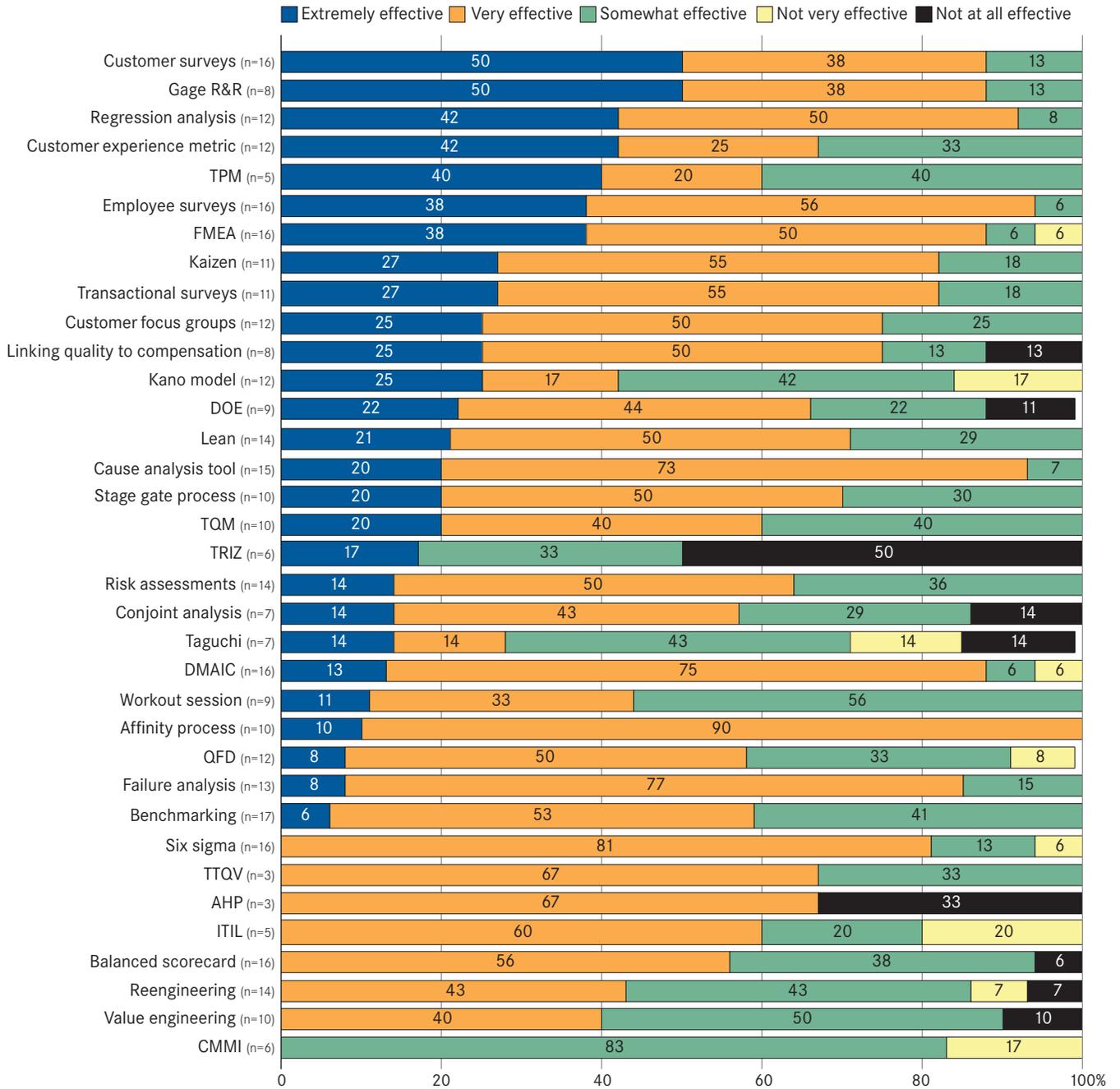
Source: Baldrige Quality Program – Criteria for Performance Excellence

Number of responses = 17
Data shown is the percent mentioned.

Appendix: Survey Results (continued)

Effectiveness of Quality Practices

The majority of quality practices in use are considered “extremely” or “very effective,” with the exception of TRIZ.

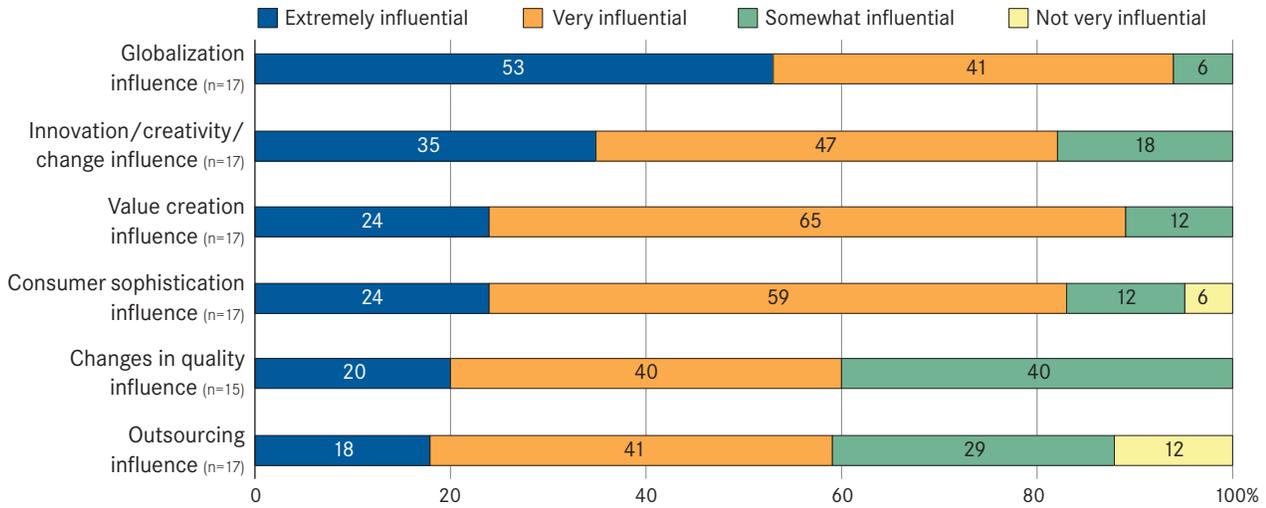


Source: The Conference Board © 2008

Appendix: Survey Results (continued)

Degree Market Forces Impact Quality

Globalization is the market force influencing the future of quality most.



Source: The Conference Board © 2008

Appendix Table 1

Practices Used To Address Challenges

Numerous quality practices are consistently cited as being used to improve Excellence in Execution; Customers Surveys are used most across all challenges.

	Six Sigma	TQM	Lean	QFD	DMAIC	Customer Surveys	Employee Surveys	Transactional Surveys	Focus groups	Reengineering	Work out Session	Regression Analysis	Risk Assessments	Gage R+R	Affinity Process	DOE	Quality to Compensation	Cust. Experience Metric	Failure Analysis	Stage Gate Process	Value Engineering	TRIZ	AHP	Conjoint Analysis	Kano Model	Balanced Scorecard	Kaizen	Rish Done	FMEA	TPM	CMMI	ITIL	Taguchi	TTOV
Profitable growth	9	12	4	12	8	8	7	6	9	5	3	7	9	6	5	6	3	8	8	7	7	3	2	4	5	7	8	8	9	3	1	2	3	1
Excellence in Execution	10	12	4	11	7	13	10	6	8	7	2	9	7	6	7	7	3	6	12	7	3	2	1	4	7	10	7	11	4	1	1	2	1	
Customer loyalty/retention	12	7	5	4	7	14	8	8	11	4	0	6	6	2	4	2	4	11	6	3	1	0	0	3	5	9	3	5	0	1	1	1	0	
Sustained/steady top-line growth	8	9	3	7	1	2	3	5	7	3	1	1	5	1	1	3	2	8	3	5	1	0	1	2	2	6	3	5	2	1	2	0	1	
Stimulating innovation/creativity/entrepreneurship	9	7	3	4	3	9	5	5	9	5	1	2	2	2	2	4	3	8	3	7	2	2	1	3	5	3	4	0	1	0	1	0		
Finding qualified managerial talent	5	2	2	1	1	3	5	0	0	1	0	0	1	1	1	1	0	2	1	0	1	0	0	0	1	3	1	1	0	0	0	0	0	
Speed to market	4	6	2	6	3	3	3	3	3	3	1	2	3	1	1	3	2	1	3	5	2	1	2	2	3	3	3	5	0	0	0	0	0	
Speed/flexibility/adaptability to change	7	5	3	6	4	6	4	5	7	3	2	4	3	2	3	3	2	6	4	2	2	1	0	1	3	2	5	4	2	0	0	1	0	
Corporate reputation	7	4	3	1	2	8	5	2	7	1	0	2	3	1	3	1	1	5	2	1	0	0	0	1	2	2	2	4	0	0	1	0	0	
Consistent strategy execution	5	4	2	4	2	6	5	2	2	1	0	1	3	1	1	1	4	3	3	3	1	0	1	0	1	2	1	2	0	1	0	1	0	
TOTALS	76	68	31	57	36	47	55	42	63	33	10	34	42	23	28	31	24	58	45	40	20	9	8	20	32	49	37	50	11	6	7	8	5	

NUMBER OF MENTIONS PER PRACTICE

Source: The Conference Board © 2008

Appendix Table 2

Future Intent with Quality Practices

Lean is the quality practice cited most frequently as needing to be accelerated over the next 3 to 5 years.

	ACCELERATE Working, and and need more of it	CONTINUE Seems to be working at current levels	EMERGING Could work, but need more data	UNDERUTILIZED Could work, but need to scale to be sure	STOP Does not work
Lean (N = 15)	73%	13%		13%	
Balanced Scorecard (N = 17)	53	35		6	6%
Kaizen (N = 13)	46	38	15%		
Linking Quality to Compensation (N = 12)	50	17	17	8	8
FMEA (N = 16)	44	50		6	
Risk Assessments (N = 16)	44	44		6	6
Cause Analysis Tool (N = 15)	40	60			
Value Engineering (N = 14)	36	29	21	7	7
Failure Analysis (N = 13)	38	62			
Benchmarking (N = 17)	35	65			
Regression Analysis (N = 15)	40	53			7
Customer Focus Groups (N = 15)	47	47		7	
Customer Experience Metric (N = 15)	47	33		20	
DOE (N = 13)	38	31	8	15	8
DMAIC (N = 16)	38	63			
Reengineering (N = 15)	40	47	7		7
Customer Surveys (N = 17)	41	53		6	
Six Sigma (N = 16)	31	63	6		
TRIZ (N = 10)	30	10		20	40
Employee Surveys (N = 17)	29	71			
QFD (N = 15)	27	33	7	20	13
Workout Session (N = 15)	33	27	27	7	7
Affinity Process (N = 12)	25	67	8		
Stage Gate Process (N = 13)	23	62	8		8
Gage R&R (N = 12)	25	42	17		17
Kano Model (N = 14)	21	43	29	7	
Transactional Surveys (N = 14)	21	71	7		
TPM (N = 10)	20	20	20	10	30
TTQV (N = 9)	11	33	22	22	11
ITIL (N = 8)	13	25	25	25	13
CMMI (N = 8)	13	13	25	38	13
Conjoint Analysis (N = 10)	10	50		20	20
Taguchi (N = 11)	9	36	18		36
TQM (N = 12)	8	58	8		25
AHP (N = 8)		25	13	25	38

Source: The Conference Board © 2008

The Conference Board, Inc.

845 Third Avenue
New York, NY 10022-6600
United States
Tel +1 212 759 0900
Fax +1 212 980 7014
www.conference-board.org

www.conference-board.org

The Conference Board China

Beijing Representative Office
7-2-72 Qijiyuan,
9 Jianwai Street
Beijing 100600 P.R. China
Tel +86 10 8532 4688
Fax +86 10 8532 5332
www.conference-board.cn (Chinese)
www.conference-board.org (English)

The Conference Board Europe

Chaussée de La Hulpe
130, box 11
B-1000 Brussels Belgium
Tel + 32 2 675 5405
Fax + 32 2 675 0395
www.conference-board.org/europe.htm

The Conference Board Asia-Pacific

22/F, Shun Ho Tower
24-30 Ice House Street, Central
Hong Kong, SAR
Tel + 852 2804 1000
Fax + 852 2869 1403
www.conference-board.org/ap.htm

The Conference Board of Canada

255 Smyth Road
Ottawa, Ontario K1H 8M7
Canada
Tel +1 613 526 3280
Fax +1 613 526 4857
www.conferenceboard.ca



Scenarios of the Future as Viewed in 2011

Gregory H. Watson

Chairman and Academician, International Academy for Quality

Past-Chairman and Fellow, American Society for Quality

Introduction

What does the future hold? Despite its stereotypical image, futuring or studying the future is not about fortune telling, and a crystal ball isn't used for these analyses. It is not possible to forecast the exact future, but we can think ahead and anticipate options for potential actions that should be considered as the future unfolds. Futures studies combine sound data research with expert opinions. They identify the most likely factors expected to affect the future and present alternative scenarios that represent a spectrum of possible futures. These scenarios do not describe what is expected to happen; instead, they help us to prepare a flexible response to the risks exposed and to cope with the unfolding future better.

Scenario development begins with research to understand the long-term (20-50 years) trends upon which the medium-term (10-20 years) trends are superimposed. The long-term trends are ascertained from scientific analysis of physical, biological, and environmental data. This process uncovers critical elements that may be hidden in short- and medium-term observations. The long-term trends always are assumed to influence the medium-term trends; however, actions associated with medium-term trends may be considered as potentially mitigating the magnitude of anticipated risks.

The Delphi technique is used to identify likely forces that will drive medium-term change. Then a spectrum of scenarios is written to expose alternative ways in which these forces might be manifested under a range of potential conditions.

This report traces the development of the scenarios for the American Society for Quality's 2011 futures study. It describes the long-term environmental factors, explains the driving forces of change, and defines four scenarios for the medium-term future that cover the spectrum from optimism to pessimism. Proposals for dynamic changes in the driving forces are identified, and a call to action for ASQ and the world's quality community are presented.

Long-Term Dynamic Factors

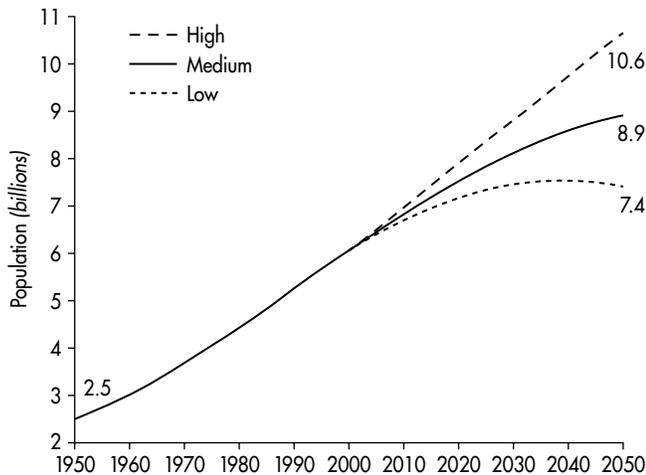
The long-term factors that serve as the basis for the scenarios relate to the fundamental needs of mankind for existence over the next 20-50 years. Adequate food supply, clean air, pure water, favorable climate, and energy supply will be affected as Earth's population continues to expand. These factors are not static; they have a dynamic range of potential behaviors. Consequently, they must be studied using probability models that consider their most likely outcomes based on a range of inputs. Both observational data and the outcomes generated from simulation models using those observations are presented here as a foundation for the scenarios.

Effect of Population Growth on the Ecosystem

A recent article by the American Association for the Advancement of Science (AAAS) projected the impact of continued population growth on food production, stating: "The world likely will need to double food production by 2050 to meet rising food demand, and investments alone won't be enough to meet that goal..." (Lempinen, 2010, p. 527). Lempinen also notes that the National Institute of Food and Agriculture at the

Prognostications: *Scenarios of the Future as Viewed in 2011*

Figure 1: UN Estimates for Global Population Growth



United Nations, Department of Economic and Social Affairs, **World Population to 2300**; downloaded from: <http://www.un.org/esa/population/publications/longrange2/WorldPop2300final> on 15 July 2011. Used with permission of the United Nations Population Division.

U. S. Department of Agriculture has reported: “Because we do not feel the hunger that gnaws at nearly a billion of the world’s citizens and because the few American farmers that feed America and much of the world are often out of sight and out of mind of urbanites, we have become complacent in the support and advocacy for agriculture research.”

This global food shortage has been caused by increasing population growth (see Figure 1), coupled with environmental changes (e.g., impact of drought). The population concentration is expected to shift to “megacities,” cities with over 10 million residents. In 2010 there were 26 megacities, but 600 megacities are forecasted for 2025, and they are expected to generate over 64% of the global gross domestic product. They also will be the dominant consumer of energy (Canton, 2011). Concentration of large populations also is likely to increase the levels of air and water pollution, exacerbating related problems such as energy poverty, inequitable wealth distribution, and shifting demographic issues associated with provision of healthcare and education.

Furthermore, evidence continues to build that climatic changes are a work in process. For example, the National Ocean and Atmospheric Administration (NOAA, 2010) recently published an academically peer-reviewed, state-of-the-climate report. After analyzing trends for 41 climate indicators, NOAA concluded that the world is continuing to warm. Key findings included the following facts:

- The world’s mountain glaciers had lost mass for the 20th consecutive year.
- Greenland glaciers lost more mass in 2010 than any other year on record.
- Arctic Sea ice has shrunk to its third smallest chronicled area.
- The average sea level has risen across the world’s oceans.

These findings support the deduction that our natural, sustainable environment is threatened more dramatically than ever before.

In the early 1970s, the Club of Rome commissioned a cross-disciplinary team (representing the fields of environmental science, systems management theory, social policy making, and futuring) to conduct a computer-simulation study that became the book, *The Limits to Growth* (Meadows, et al., 1972). Although this book was widely debated, it raised the alarm regarding the global long-term consequences of a rapidly rising population in a world with finite natural resources. The authors subsequently reproduced the analysis of their initial scenarios and published the results in another book, *Beyond the Limits* (Meadows, et al., 1992). Once again, the results were not encouraging, and the study predicted a collapse in global systems associated with population growth.

Such predictions are not certain, however. For instance, consider the concerns that were raised in the late 1980s about the depletion of the atmosphere’s ozone layer. Here’s what transpired when this issue received decisive action across the globe:

- Identification of the “ozone hole” above Antarctica lent credence to findings in the *Limits to Growth* study methodologies (Meadows, et al., 1972, 1992; AtKisson, 1999).

Prognostications: *Scenarios of the Future as Viewed in 2011*

- In 1986, chlorofluorocarbons (CFCs) were recognized as the culprit for depleting the ozone layer over Antarctica.
- Regulations were enacted and elimination of this chemical's production had occurred by 1997. This global transition was mediated successfully by the United Nations Environment Program (UNEP), which collected the scientific data, provided the analytical findings, hosted the political process, presented the case to governments, and facilitated the global consensus to take appropriate action.
- The level of CFCs continued to build in the stratosphere despite the atmospheric mixing that delayed the migration of CFCs from the Earth's surface to the stratosphere, where their damaging effects occurred.
- By 2010, scientists had observed a downturn in the growth rate of chlorine and bromine in the stratosphere that are the deleterious byproducts of CFC emissions. A slight improvement in the ozone layer also has been reported.
- Sadly, the ozone layer is not expected to recover to its pre-1950 level until the mid-21st century due to the continuing journey of CFCs that were released years ago.

Mankind's progress in overcoming this unintended attack on the world's environmental system was reported in *Limits to Growth: The 30-Year Update* (Meadows, et al., 2004). The process began with the presentation of scientific data in 1985, and a series of meetings advocating change followed (Montreal in 1987, London in 1990, Copenhagen in 1992, Vienna in 1995, and Montreal in 1997). The prolonged lead time required to reverse this destructive process and restore our precious global ecosystem demonstrates clearly the imperative of responding to negative effects as early as possible.

The success with ozone management, however, has not been replicated with other similarly destructive gases. In 1992 an international treaty, the United Nations Framework Convention on Climate Change (UNFCCC), was adopted to consider options for reducing global warming and develop coping mechanisms for

any inevitable temperature increases. Subsequently, in 1997 some nations approved the Kyoto Protocol, an addition to the treaty.

These acts included provisions for the global management of six greenhouse gases (GHGs)—carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). GHGs have a warming effect on the climate when released into the atmosphere (see Note 1). Many of these gases are released in processes caused by human actions (anthropogenic) rather than natural forces. The Kyoto Protocol included more powerful and legally binding targets for reduction of GHGs, but those targets apply only to the 37 industrialized nations that approved it.

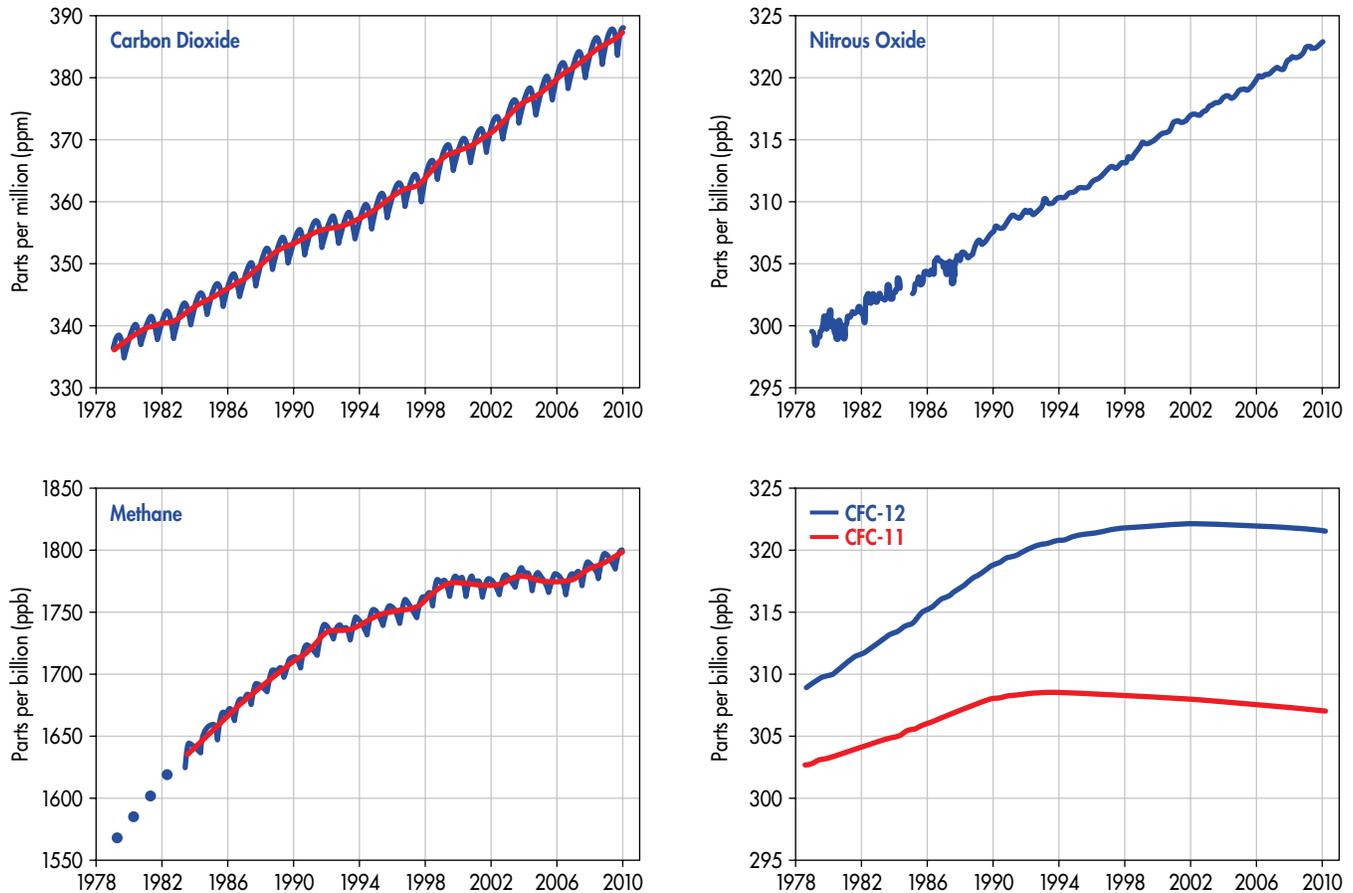
Unfortunately, however, efforts associated with addressing GHGs have been far more limited than those used to reverse the effects of CFCs. For instance, although the United States signed the treaty in 1992, it did not accept the Kyoto Protocol; therefore, it has not committed to attaining the targeted reduction levels.

Even the Kyoto Protocol falls short of the appropriate requirements for addressing GHGs. It does not specify limits for all of the gases known to influence climate change. The impact of these efforts on GHGs cannot be ascertained comprehensively because of these constraints. In fact, the amounts of CO₂, CH₄, and N₂O have continued to increase as shown in Figure 2. As a producer of 36% of all global GHG emissions but a non-participant in the Kyoto Protocol, the United States must accept some moral culpability for these results. The current level of state and city GHG emissions is reported by the Environmental Protection Agency (EPA, 2011) annually in its Greenhouse Gas Inventory (see Note 2).

In 2001, President George W. Bush requested that the National Academy of Science (NAS) assess the current understanding of the sources and mechanisms of climate change, and a final consensus report by America's leading scientists was published in 2008. The investigation included 29 observational studies and concluded that "human activities are changing the climate" (National Academies, 2008).

Prognostications: *Scenarios of the Future as Viewed in 2011*

Figure 2: NOAA Reported AGGI for 2010



Butler, J. H. Retrieved from <http://www.esrl.noaa.gov/gmd/aggi/> on 15 July 2011.

The studies mentioned in this report along with many others provide sobering insights into the potentially disastrous environmental changes that the planet may face in the coming decades.

Effects of Wealth, Social Systems, and Politics on Our Ability to Respond

These admonitions may have served as the impetus to the intellectual contributions of Karl Marx and Vilfredo Pareto regarding the future of the human race, its pursuit of wealth, social systems, and politics.

Marx divided society into two classes. The bourgeoisie class is economically privileged and measures wealth in terms of capital. Contrastingly, the proletariat class struggles economically and measures its

wealth in terms of children. Pareto noted that 80% of the world's wealth was possessed by only 20% of its inhabitants, leading to the conclusion that 80% of the world's inhabitants are members of the proletariat class. Some nations call this group the lower or "ultra-poor" class. One motivation for the pursuit of democracy is the promise of an improved quality of life that it offers the proletariat. With increased ability to control one's economic destiny, people are able to determine the value proposition that affects their lives. This motivation drives the 80% of the world's population that is the proletariat to improve their quality of life and living conditions so they can attain the lifestyle of the affluent 20% of society that was in the bourgeoisie. In many countries, therefore, the

Prognostications: *Scenarios of the Future as Viewed in 2011*

movement toward social democracy requires redistribution or leveling of wealth across society to assure equity in quality of life.

Striving for an increased standard of living becomes a reinforcing activity—more wealth drives the desire for more wealth. Increasing wealth decreases population as people shift from the bourgeoisie to the proletariat class and seek to conserve their wealth and protect their achievements. The only way to prevent this behavior would be to change the expectations of society. A new value system based on austerity, rather than riches and a flamboyant lifestyle, would need to emerge.

All of the scenarios described in *The Limits to Growth* presumed increasing wealth as a motivating factor. Without a change in the value system, these scenarios would lead to disruption of homeostasis and a collapse of the global ecosystem. As declared in the book, this is the likely outcome “if the policies that influence economic growth and population growth in the future are similar to those that dominated in the last part of the twentieth century, if technologies and values continue to evolve in a manner representative of that era, and if the uncertain numbers in the model are roughly correct.” In a sensitivity study of the World3 model used for the computer simulation to develop the scenarios, the investigators discovered that changes in the inputs would only delay the timing of the outcome, not the effect (Meadows, et al, 2004).

Where does this leave us? Although the facts have been collected and a general understanding of potential future disasters has been obtained, mankind remains in a quandary about what to do. Our leaders argue inconsequential political points and invest worthless energy in attempting to assign blame, rather than delivering real solutions to our real problems. We need to affect a transformative break in the negative cycles that are preventing us from taking appropriate action. If we continue to value ever-expanding growth as the primary indicator of quality of life, we will be creating a doomsday future.

We can draw three conclusions from our investigation of the long-term environmental factors that affect future possibilities:

- Many thoughtful researchers and scientists have toiled for years to observe and report on the disintegration of our intricate web of natural systems that have supported the Earth. This fact has been established through numerous studies conducted by the NAS.
- Our most important global ecological systems are deteriorating rapidly—perhaps too rapidly to prevent their collapse. This assertion is based on extrapolated simulation scenarios from the World3 studies reported in *The Limits to Growth*.
- Unpopular political alternatives have paralyzed lawmakers, increasing the burden they feel from these conclusions. They feel frustrated and hopeless because they are faced with making decisions that are not aligned with the promises they made previously to their constituents. The easiest path forward is to ignore these long-term problems, focusing instead on short-term issues. Our elected officials lack the political will to heed the distress signals detected by our scientists. They no longer want to hear any more bad news about the environment. In effect, they are saying, “Please let me change the channel or surf to a different website; I don’t want to watch this depressing show any more!”

Clearly, the time has come for society to change the framework under which it operates. The four scenarios included in this futures study can help us answer two fundamental questions: What can we do to prepare for the effects of these anticipated changes? What steps can we take to inhibit or prevent their occurrence? They can help us assess the alternatives available to the global quality community as we encourage leaders to adopt the necessary transformations and foster a more altruistic value system to drive individual and collective actions. First, however, we must define the context for the scenarios.

Long-Term Scenario Assumptions

The scenarios postulated by *The Limits to Growth* studies have illuminated our current environmentally induced crisis. Population growth, exacerbated by the desire for increased quality of life and the unintended consequences of environmental pollution are the basis

Prognostications: *Scenarios of the Future as Viewed in 2011*

for these pessimistic projections. Our goal in this report is to create similarly enlightened scenarios that identify the future of quality and its role in influencing both the short-term forces of change and the long-term cycles of environmental change.

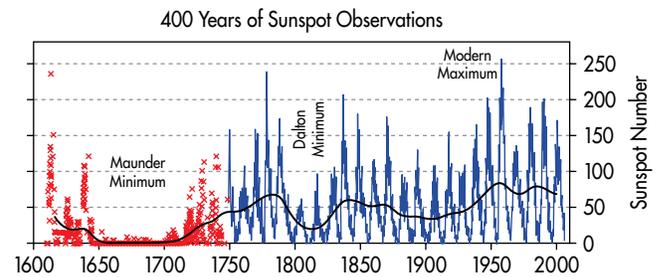
The scenarios developed here incorporate both the medium- and long-term factors. The medium-term factors are based on the forces of change generated by the ASQ Delphi Study. The long-term factors are derived from permutations of possible global environmental changes, involving two considerations: climatological change and solar pacification. The issues associated with climatological changes already have been described; now an explanation of solar pacification and its effects will be presented.

Recently, astronomers have observed changes in the activity level of solar bright spots, commonly called sunspots or faculae. Sunspots are thermal leaks in the sun's surface that allow sub-surface solar energy to escape, leading to an overall increase in radiated energy. This leakage appears as a surface effect, a dark spot on the sun. Astronomers have observed sunspots visually since the 1600s, and a history of recorded observations is shown as Figure 3.

Earlier sunspot records were recorded based upon visual observations from the Earth's surface. Figure 3 illustrates a short-term cycle of 11 years for sunspot activity where a maximum level has been forecasted for 2010-11. A report from the National Solar Observatory (NSO) stated: "As the current sunspot cycle, Cycle 24, begins to ramp up toward maximum, independent studies of the solar interior, visible surface, and the corona indicate that the next 11-year solar sunspot cycle, Cycle 25, will be greatly reduced or may not happen at all" (American Astronomical Society, 2011, June 14). The outcome of such an occurrence would produce a very chilling effect on our ecosystem.

The period 1645-1715 is known as the Maunder Minimum after Edward W. Maunder, who discovered this period of minimal sunspot activity. Maunder also noted that the reduced sunspot activity corresponded with the coldest recorded temperatures (an average

Figure 3: Sunspot Activity Cycle



Retrieved from <http://en.wikipedia.org/wiki/Sunspot> on 15 July 2011.

drop of three to seven degrees Celsius) in Europe over the previous 500 years. It is worth noting that another study reported that the highest average winter temperatures in the past 500 years occurred in the last decade of the 20th century. (Luterbacher, et al, 2004).

In two prior cycles (1420-1570 and 1790-1830) such cooling effects also were related to decreased sunspot activity. These observations and analyses have led to an evolving theory that postulates sunspot activity as a cause of global cooling and a plausible cause of the advent of the Ice Age. When solar pacification occurs, the Earth is highly susceptible to global climatic influence. For example, during the last solar minimum in 1816, Mount Tambora (Sumbawa, Lesser Sunda Islands, Indonesia) erupted, measuring seven on the Volcanic Explosive Index (VEI); the largest VEI in recorded history is eight, which occurred in 180 AD (see Note 3). The Mount Tambora eruption caused less sunlight to pass through the Earth's atmosphere and resulted in global cooling in what is popularly called the "year without summer." It also is considered the proximate cause for the global famine that occurred at that time. Winter temperatures in New York dipped to -34°C , which reflects temperatures found in the coldest winters of Northern Finland (Wikipedia, n.d.).

The scenarios developed for this futures study take the three conditions—shifting demographics in an expanding global population, environmental impact, and political will to change—into account:

Prognostications: *Scenarios of the Future as Viewed in 2011*

Shifting Demographics in an Expanding Global Population

As global population grows, we will experience an aging in the demographic profile of most developed countries, coupled with the emergence of a youth bubble in developing countries. Three alternative future states considered in the scenarios are described below:

- *Unrestricted population expansion.* Human population continues to grow; the UN predicts the high level will rise from 6.1 billion in 2010 to 10.9 billion by 2050.
- *Stabilization of the population growth trend.* Human population will maintain a constant growth pattern and reach 8.9 billion by 2050.
- *Stabilization of human population.* Human population growth decreases to a level where the population is 7.4 billion by 2050.

Environmental Impact

The effects of global warming will be offset by the atmospheric cooling as the sun changes its radiation pattern.

- *Solar pacification.* Hibernation in sunspot activity will occur during a solar minimum that will be endured for 50-150 years. This event will decrease the average temperatures three to seven degrees Celsius. At the end of this cycle, the solar activity will return to its typical historical level, and its effect on average temperatures will disappear.
- *Climate change.* Anthropogenic climate change will cause temperatures to increase two to four degrees Celsius. This effect will need to be managed over the long term, even if it is offset temporarily by solar pacification.

Political Will to Change

The ability to achieve a consensus direction will be confounded by the alternative political viewpoints. Changing the degree of collaboration in consensus decision making will be necessary to provide insight into mankind's ability to chart a direction out of the mess that is foreseen. The three following potential responses are considered in the scenarios:

- *Enlightened response.* A coordinated global political response will focus on attaining total environmental stabilization. The impact of all projected destabilizing factors will be anticipated, and collaborative efforts will apply the technological resources of all nations to achieve an equitable utilization of the Earth's natural resources.
- *Scientific response.* A coordinated, global, political response will focus on the mitigation of scientifically proven and politically accepted factors that have been demonstrated to impact the environment adversely. These factors will be recognized as essential for maintaining human life under managed developmental conditions.
- *Dysfunctional response.* Political divisions between the developed and undeveloped nations will inhibit agreement and coordinated action to address the deteriorating situation. Finally, it will become obvious that humanity has passed the tipping point and is no longer capable of mustering a coordinated response to the environmental crisis.

One outcome associated with future studies should be to influence the choices for political policy responses. Politicians are faced with constant choices; in the case of the critical environmental conditions that are evolving, political leaders can choose to support or reject scientific evidence. Similarly, they can choose whether or not to join together in a coordinated global response to these issues.

The conflict between developed and undeveloped nations can be linked to the continuing global trend to embrace a democratic form of government. At the start of the 20th century only 25 nations comprising just 12% of the world's population lived under some form of democracy. By mid-century, this had grown to 42% of the world's population, and electoral democracies represented 120 of 192 countries by the end of the century. This constitutes 63% of the population—3.9 of 6.1 billion people.

Why does adoption of democracy generate such political conflict? The answer is found in the changing expectations of people living under the direction of a

Prognostications: *Scenarios of the Future as Viewed in 2011*

democracy. Their hopes for an improved lifestyle increase as they pursue economic freedom as well as political freedom. This raises the demand for consumer goods and housing, which can influence environmental cycles.

Of course, some of these forces will have a stronger influence on alternative future scenarios. The dynamics and interconnection among the forces has a significant effect on their resultant outcomes. Furthermore, these forces fall into the following two broad categories:

- Life sustenance factors. These include the fundamental requirements of human existence, such as air, food, water, shelter, warmth, safety, security, stability, protection, etc
- Life enhancement factors. These forces are influenced by humans' cultural, social, psychological, and emotional needs.

It is important to note that the second set of forces will be irrelevant if the first set of factors is not satisfied.

The influence of these forces differs, depending on the developmental progress of the society. It is only natural that developing nations focus on achieving sustainability. On the other hand, developed nations focus on those forces that enhance quality of life, such as personal growth, recognition of achievement, and the prestige of reaching one's full potential. Strongly coordinated political will is needed to balance the current structural disparity and assure equity of opportunity for all mankind.

Medium-Term Forces of Change

The long-term forces of change are likely to require transformative response to ensure sustainability of the planet and mankind. The medium-term forces of change are different; they require us to adjust our daily practices. These forces declare that changes in the world have become so great that we can no longer rely on our historical policies and old ways of working to operate any longer.

We all recognize the inevitability of change. ASQ's global panel of experts identified the following rank-ordered key forces:

1. Global responsibility
2. Consumer awareness
3. Globalization
4. Increasing rate of change
5. Workforce of the future
6. Aging population
7. 21st century quality
8. Innovation

These medium-term forces will drive the changes affecting the future of quality. They provide a backdrop for the scenarios that help us answer the following questions: "How can we harness the positive ideas and capabilities of mankind to combat the systematic effects of historical decisions?" and "How can we restore the environment, enhance peoples' quality of life, and improve the global economy?"

Understanding the Driving Forces

The driving forces described in this section will manifest differently in each scenario. Baseline definitions are provided for each factor to facilitate an understanding of their nature, as well as indicate how their influence might vary across the scenarios.

Global Responsibility

Global responsibility combines social responsibility, environmental responsibility, and good governance with a growing awareness of the global impact of local decisions. A rapidly growing population is exhausting our planet's finite resources. Waste that was once economically acceptable is becoming socially unconscionable. The breadth of global responsibility spans governance, human rights, labor practices, fair operating practices, environment, and consumer interests. ISO 26000, supplemented by the risk-management guidelines in ISO 31000, describes the contributions of these issues to society. Global responsibility is a call to ethical leadership at all levels of society—governments, organizations, schools, civic organizations, neighborhoods, families, and individuals.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Waste, a loss incurred by society from any misused or underused resources, including people, becomes a primary battlefield when global responsibility is accepted. Waste involves economic, risk, and operational dimensions. Addressing waste requires flexibility and a new perspective. Zero-based budgeting analyses of sunk costs must be used to optimize resource utilization, focusing on future needs, rather than historical programs and allocations. As resources become more scarce, prioritizing their allocation is essential, and the allotment process must minimize waste through responsible design and stewardship across the full product life cycle. Linking innovation and waste-reduction efforts must be a key strategy for a globally responsible society.

In the future, the definition of waste will become more comprehensive. Waste associated with the poor utilization of materials during the design process will be avoided because the risk associated with design and development will be understood better, and these processes will be managed more effectively and efficiently. The waste of human potential associated with undeveloped minds will be recognized as a loss to society. Additionally, the cost of unethical conduct will be acknowledged as having a negative effect on human lives.

Consumer Awareness

Consumer awareness is an increasingly important force as consumers use their knowledge to make purchasing decisions, giving them a power edge to drive the marketplace. The Internet has changed the significance of this force considerably. In the past, consumption was limited primarily to locally available products and services. Today, consumers can shop anywhere in the world online, but that is only a small piece of this changing force. With Internet access so readily available, consumer purchasing decisions are based not only on product/service knowledge but also on the practices of the provider.

Social media takes this development even further, making information *instantly* available. Consumer behavior moving at the “speed of electrons” has both positive and precipitously negative ramifications. For

instance, providers will be expected to respond to consumers’ collective behaviors at similar rates.

As previously mentioned, increased consumer awareness has changed the marketplace, and consumers are using their additional power to demand that providers deliver goods and services that match needs. Flexible organizations that master the ability to keep pace with changing consumer requirements will be rewarded. Service providers already are using database information to tailor customers’ experiences to fit specific needs. In the future, manufacturing will become similarly lithe, and mass customization of products for local markets eventually will lead to economic order quantities of one and zero waiting times.

Globalization

Globalization is the only force consistently identified in ASQ studies since 1996. It was top on the lists in 2005 and 2008, and its influence was twice that of the next force on the 2008 study. Its meaning, however, has shifted since 1996. At that time, globalization was perceived as an opportunity for developing companies to capitalize on new and emerging consumer markets. By 2005, the global market opportunity was offset by fear of competition due to lower labor costs. What seemed certain by 2008 was that whether globalization was an opportunity or a threat, it was an undeniable reality.

Although foreign-produced goods and services may be less expensive, a sense of social responsibility drives local production. This is a neutralizing factor that reduces the waste associated with packaging and transportation, as well as energy consumption.

Global customers and supply chains represent a greater share of organizational strategy. Risks and opportunities in a global business environment are huge, and both organizational executives and governments are reeling in response to issues that are no longer bound by national borders. Consequently, complexity has increased and will continue to do so; humans will struggle to deal with the challenges of managing global enterprises across borders, cultures, and stages of economic development within the constraints of finite resources.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Increasing Rate of Change

The rate of change is accelerating, and it has moved from a background force in the early studies to a more prominent position on this list. When the 1996 study findings were reviewed in conjunction with the 1999 project, a common comment was “The only thing we underestimated was the rate of change.” In that study this force was called “speed.”

Of course, this force is most obvious in relation to the increasing rate of technological change, which also is accompanied by opportunities and threats. Among the most significant dangers is society’s inability to adapt to the changes brought on by new technology. A failure to adapt new technology effectively can create negative consequences. On the other hand, new technology offers enormous opportunities for solving world problems—energy, pollution, fresh water, food, housing, and health all may benefit from these developments.

Technology is integral to the solution of these and a host of other problems—some of which haven’t developed yet. Population growth was the driver of economic success in the 20th century, but it has been passed by technology in the 21st century. Technology, however, is a much less predictable force than population growth, so it is certain to surprise us in ways that disrupt our status quo.

Futurists already are predicting that nanotechnology will have a more significant effect on our lives than the Internet has had. Other, currently unnamed technologies will follow rapidly. Cloud computing and data ubiquity are changing the way we operate, making computer costs more affordable and causing massive processing power to be coordinated better. Six years ago, one terabyte of data storage cost approximately \$100 (USD), and it was the size of a small handbag. Today, two terabytes are the same price, but their size has reduced to the footprint of a cellular phone!

Another sign of the increasing rate of change is product life cycles. Many consumer electronics now have development life cycles of six months or less, and they are projected to become even shorter in the

future. Industries will be born, become significant in our lives, and disappear with increasing rapidity. Being first to market will win the advantage, and there may be little opportunity or time in the market for second place. Emphasis on speed will require organizations to anticipate the future better and be prepared to respond to customers’ feedback with lightning speed. The cost of missing any market cue at today’s speed of information sharing could spell disaster for producers.

Workforce of the Future

The workforce of the future will challenge our current notions of functional talent, the nature of work, the operation of the workplace, and channels and means of learning. A few of the potential changes are described below:

- *Workforce composition and practices.* Unemployment, as we currently define it, may become a thing of the past. The number of jobs available will exceed the number of competent people to fill them as the population profile of the world shifts. Demographers currently predict that organizations will find themselves competing for talent, which will move jobs around the globe. High-tech companies already are experiencing this. This search for talent coupled with technological advances will change the nature and place where work is performed. Organizations will grow increasingly flexible in their definitions of work engagements. Retirement no longer will be an age-dependent phenomena. People will continue working, but they will insist on more flexible work schedules and worksites that reduce commuting.
- *Learning requirements and approaches.* The rapid information expansion (doubling every 18 months) will drive the acceleration of technology. This will pressure organizations to increase workforce knowledge. Lifelong learning will gain new meaning, and just-in-time education will become a reality. Education also will evolve so that everyone will need to be both a learner and a teacher. Traditional providers of education (schools and universities) will need to place a premium on preparing students to learn. Emphasis will shift from the learning content

Prognostications: *Scenarios of the Future as Viewed in 2011*

to the learning process. Organizations will shift their expectations from knowledge, skills, and experience toward demonstrated capability. Professional certifications and graduated, competency-based models will grow in importance.

- *Knowledge acquisition and application.* Although knowledge will grow, the rate of wisdom loss will accelerate. Systems for preserving the wisdom of the past and building on it to gain new insights will be required. Knowledge and theory no longer will be treated as disposable property that can be discarded in favor of the latest, more fashionable concepts.

Aging Population

The aging of the world's population is related to extended life expectancies. Although this development has obvious benefits, it also challenges world resources and places increasing pressures on the cost of providing healthcare to a larger percentage of the world's population. The ethical and moral issues associated with a belief in extending life "at all cost" have not been addressed. Likewise, current models for social welfare assume that workers underwrite non-workers, but declining world population and an expanding number of aged people will require new social systems.

As mentioned earlier in this section, retirement as we know it today will change substantially. Working longer will be a requirement for many people, who will need additional economic means to survive. With organizations searching for talent, the aging population will be able to make a significant contribution to society.

Demographers predict that by 2025 the majority of the population will be 65 and older. This represents the highest number of aged citizens in history. Little is known about the consumption and lifestyle needs of this increasingly significant "elder market." By this stage of life, many sustenance costs, such as those related to housing and child rearing are no longer a financial consideration. It is apparent that this shift in the market will offer opportunity for many organizations, but it also will require substantive change.

Although quality of life is likely to be an important expectation for the aging population, it may take

on new meanings. Elder citizens are less likely to be driven by the need for "more" because their basic needs already have been met. This could affect the traditionally accepted relationship where rising population is the engine of growth, and if that happens, the world's economy could be impacted dramatically.

21st Century Quality

In this study, quality has been identified as force of change. To understand its role in the scenarios, a brief discussion of the evolution of the field over the past 25 years may be worthwhile.

Whereas the field originally emphasized a multitude of disjointed methods, it has become more holistic and now addresses systems across the entire organization. Pride of workmanship was the original focus. Over the years, the emphasis shifted to process execution and the resultant product and service outputs—from inspection to assurance of customer expectations to preventive action and finally to targeting to achieve perfect quality. Recently, quality expanded to the innovation and design processes that precede the actual provision of goods and services.

Fundamentally, quality in the last century was defined by control and improvement. Although those approaches are still essential, they will not be sufficient for the 21st century; near-perfect product/service quality will be the minimum for competitiveness in the future. The best companies already are moving beyond product/service quality to managing the total customer experience. Best-practice companies around the world are demonstrating the efficacy of quality applied to the improvement of the whole organization. Change and transformation are the emergent tools of quality.

Throughout this evolution one immutable truth has not changed, however: quality is ultimately what customers accept and value. Organizations whose cultures are dedicated to and conscientiously provide quality will attain a sustainable competitive advantage. Organizations that don't adopt quality practices are likely to be subjugated to their competitors. Although the value of quality practices have been proven at both the product/service and enterprise levels, they are still

Prognostications: *Scenarios of the Future as Viewed in 2011*

not accepted and applied in all organizations. The future still will offer significant opportunities for quality professionals to expand application of quality concepts and tools in different nations and organizational types across the globe.

The horizons for quality will go beyond these uses, however. Quality will become an instrumental global force for helping mankind solve its greatest societal challenges. Quality will become a catalyst of change—one that levels the playing field of petty differences and contentious relationships, and one that fosters collaboration, elimination of root causes, and achievement of system-level outcomes that will improve the planet and the lives of its inhabitants.

Innovation

In a world driven by increasing rates of technology and product/service changes, it is inevitable that innovation would be a force affecting the future. Innovation is the process of creating and implementing imaginative and useful concepts. Although traditionally associated with the research, design, and development of new products and services, in the future innovation will be applied to all aspects of the human experience.

Innovation implies the ability of an organization to exploit human creativity and technology. Successful innovation processes anticipate customers' needs—expressed or unexpressed, known or unknown. The result is the provision of products/services that excite customers. Innovation is a driver in today's changing world, and it will become even more so in the future.

Innovation not only will be necessary for improving existing works and/or conditions but also for conceiving radically new, breakthrough concepts. It will become the lifeblood of organizations that will be facing increasing complexity and a plethora of consumer expectations. A continuous stream of valuable innovations will be the minimum requirement for organizational success. It also will be essential for solving the problems of the growing population, deteriorating environment, and the ineffective and inefficient global political system.

Leaders will need to become adept at creating organizational cultures that are dedicated to systematic, consistent innovation. This leadership competency will need to be coupled with the ability to manage quality, risk, and financial returns. Organizations with these leadership skills integrated into their decision-making processes will thrive, and the remaining organizations will stagnate and die.

Scenarios of the Future

The scenarios chosen for the ASQ future study are designed to challenge our thinking by providing a broad spectrum of possibilities that reflect the perspective of the identified key forces for change. The scenarios represent a series of four potential circumstances that could evolve from our knowledge of the current state. These scenarios do not in any way represent a forecast of any future that will occur or even which might be desirable. Scenarios are used in future studies as a means to think differently than we do in our routine, daily life. They encourage us to consider what would happen if our world migrated from the current state to this possible future state. What are the potential hallmarks of change along the various journeys represented by the scenarios? Learning helps to open our minds to new possibilities and opportunities that can shape the future in different ways (Schwartz, 1991).

The question that must be addressed is not whether these circumstances will occur but how their occurrence will affect the world and how mankind will respond to them. These long-term forces differentiate the four scenarios, providing a natural and understandable way to describe them in the associated case studies. The key characteristics of the four scenarios include the following attributes:

- **Scenario 1: Global Awakening—The Utopian Scenario**

Population: Population stabilization in the range of six-to-eight billion people

Environmental: Offsetting climate in conjunction with a long solar minimum

Political: Enlightenment and coordinated global action

Prognostications: *Scenarios of the Future as Viewed in 2011*

- **Scenario 2: Resource Restoration—The Preferred Scenario**

Population: Population at the replacement rate of eight-to-10 billion people

Environmental: Offsetting climate in conjunction with a moderate solar minimum

Political: Collaboration among developed and developing nations

- **Scenario 3: Death by 1,000 Cut—The Status Quo Scenario**

Population: Population growth to over 10 billion people

Environmental: Offsetting climate in conjunction with a short solar minimum

Political: Minimal collaboration and rigidity in political positions delaying corrective action

- **Scenario 4: Past the Tipping Point—The Doomsday Scenario**

Population: Population growth to 10 billion followed by rapid declines to less than six billion

Environmental: No solar salvation, generating a global collapse of the ecosystem

Political: Contentious political rivalries have blocked agreement on a path forward, so no decisions have been made; chaos and anarchy prevail

Scenario 1: Global Awakening

The people and nations of the world have awakened and now understand and anticipate the complex, multi-dimensional, systemic nature of the growing global crisis. They have taken positive, enlightened technical and political action, coordinated through the United Nations, to assure equitable management of a sustainable world.

Long-term technical solutions include the following:

- *Resolution of issues related to nuclear power.* Generation of clean, more efficient nuclear energy through fourth generation, fast-neutron reactors; storage, recycling, and disposal of nuclear waste; and increased electrical-system power efficiency; and improved transmission-loss management through universal smart-grid technology.

- *Biotechnology.* Ability to understand and safely manage genetic modifications to improve crop yield and resistance to drought and pests.

- *Nanotechnology.* Delivering medical solutions to target specific diseases and promote cardio-respiratory health.

Solution of these ecological and energy-management issues became possible during a 40-year period of solar pacification. A solar minimum offset the exponential heating effect that was created by the anthropogenic climate change. The solar minimum allowed mankind a reprieve from climate deterioration. This wake-up call caused the people of the world to join forces and take seriously the cumulative impact of local pollution on the global environment.

The precedent of having the UN coordinate and balance actions had been instrumental in reversing the ozone depletion crisis of the late 20th century. Now this approach has been adopted to define requirements for economic development, helping to assure improved quality of life while managing the global environment in a way that maintains the human race at a sustainable global population of eight billion people. The appropriate use of technology has been employed to eliminate the risk of potentially destructive environmental failure modes. Statistical analyses have determined the actions that are most likely to reverse the effects of environmental pollution on the ecological systems of the world. Global resource balancing has led to the “have” nations underwriting the “have-not” nations, preventing actions that would undermine the ecological balance. Quality methods and techniques have been built into local economies, generating win-win management of the global economic marketplace. The UN Global Economic Council focuses on the well-being of the world community rather than on individual nations seeking their own advantages. Technology is leveraged to solve the problems that most affect mankind as a whole, rather than merely for economic return—especially for medicines and living infrastructure systems.

Table 1 indicates how the key forces identified during the ASQ 2011 future study influence this scenario.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Table 1: Influences of Key Forces on Scenario 1: Global Awareness

Key Force	Nature of Its Influence on This Scenario
Global Responsibility	<ul style="list-style-type: none"> • Nations align by regional divisions of nature (e.g., by dominant watershed rather than by geo-political or cultural boundaries). • Focus on collaboration assures all people enjoy an equal opportunity to access the Earth's bounty. • New economic currency measured in terms of clean water, pure air, adequate foodstuffs, and sufficient energy, rather than monetary values that do not reflect basic human needs.
Consumer Awareness	<ul style="list-style-type: none"> • Recognition that rampant consumption of resources is detrimental to a sustainable world. • Wasteful transformation of resources into useful products is not tolerated. • Definition of quality in terms of luxury replaced with pragmatic utility in both the production and life cycle application, assuring minimal total cost to society. • Consumer decisions driven by a new wave of austerity. • Consumerism no longer is a motivation for economic growth.
Globalization	<ul style="list-style-type: none"> • New global playing field generated by shift from monetary policy (exchange of money) to social policy (exchange of value). • Associated new indicators integrated with fundamental human rights—the right to exist, socialize, and obtain personal development—across all nations and organizations. • Emphasis moves to the similarities among nations and races, instead of the distinctions. • Collaboration and focus on mutual benefits enhanced by increased capability to communicate across cultures. • Greater rapport exists in the face of diversity rather than animosity and divisions that alienate people.
Increasing Rate of Change	<ul style="list-style-type: none"> • New perspective on change—it can be harnessed and is not always required. • Excessively rapid or frequent change understood to be wasteful. • Competition as a driver of change replaced by cooperation. • Social democracy replaces the capitalist motivation for all mankind to join the ranks of the bourgeoisie. • Technology managed across all companies. • Technology transitions minimize waste and loss to society.
Workforce of the Future	<ul style="list-style-type: none"> • Work redefined as “any motion that produces value and benefits society” due to renovation of the world value system. • Work considered to be a developmental process rather than a series of completed actions. • Continuity in strategic direction and alignment of purpose increase in value because they eliminate waste and take advantage of past wisdom and lessons learned. • Future performance effectiveness and efficiency leverages these new circumstances.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Table 1: Influences of Key Forces on Scenario 1: Global Awareness (continued)

Key Force	Nature of Its Influence on This Scenario
Aging Population	<ul style="list-style-type: none"> • Aging population becomes a resource of wisdom for society. • Older citizens remain active to maintain exceptional healthcare and forgo the “social benefit” of retirement. • Elder generations bear the responsibility for the effects harvested in prior years and help to facilitate required social transformation to make the world a better place.
21st Century Quality	<ul style="list-style-type: none"> • Quality has become the pervasive value of the new society, reflecting both the objective of the social system (democratic quality of life) and a motivator for minimizing the waste of resource losses to society (known as the “Taguchi effect” in honor of the Japanese engineer whose concept of value-based management created an economic foundation for the new non-monetary value system that has been introduced as a quality of life initiative by the United Nations). • The philosophy, methods, and tools of quality have been incorporated into all engineering, business, and social science academic disciplines and are taught in the common core curriculum. • All professional societies/associations sponsor groups that focus on the adaptation of quality into their discipline and body of knowledge. • Quality is truly ubiquitous, being an essential factor in all professions and organization types. • Quality provides the direction for rational decision making in an uncertain world, contributing to the discussions of all questions raised in society.
Innovation	<ul style="list-style-type: none"> • Inclusive innovation has evolved to become the hallmark of transition to future generations of mankind. • Growing social awareness has increased mankind’s appreciation of the benefits of human diversity for developing and applying potential new technologies that eliminate the squandering of resources and create lasting value. • The general concept of innovation has separated into macro-innovation (focusing on the global environment and the inter-system operability) and micro-innovation (focusing on new technologies, products, and services). • Macro-innovation minimizes total waste across all global resources. • Micro-innovation solutions require evaluation cycles to assure waste is avoided and developments generate global sustainability. • Innovation has moved from an art to a science that contributes to the policy decisions that govern global activities.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Scenario 2: Resource Restoration

Nature has granted mankind a reprieve in the form of solar pacification, which lowered the average earth temperature 7°C. Although global warming effects that have occurred over the past 40 years continue to build, they have been masked by the decrease in solar radiation caused by the reduction in sunspot activity. These cooler temperatures have rolled back some of the negative consequences of climate change by relieving the symptoms of anthropogenic global warming. They do not address the root causes, however, and merely are delaying the long-term impact of global warming.

The following factors have significant influence on the quality of life for all people:

- The mini-Ice Age has benefitted mankind by stimulating world leaders to face the reality of our fragile environment. A more conscientious approach for attaining a systemic solution of the driving causes has been adopted.
- The growing population has been recognized as a key factor in climate change, so global leaders have agreed to use a combination of tax policy and contraception to limit increases to eight-10 billion inhabitants.
- Additional work is underway to improve infrastructure and support this population with pure water and adequate food.
- The need to provide meaningful and honorable work while sustaining the global ecosystem now is emphasized in decision making.
- Universal education is encouraged, building global literacy and increasing participation in local and national politics.
- Organizations have begun to realize their dependence on a steady supply of affordable energy, clean air, and pure water.
- Technological developments can extend the projected life of known resource reserves by creating more efficient applications. For instance, the nuclear power industry has increased its previous 60-year estimate for uranium reserves to over 3,000 years, based solely on technological advancements.

- The world is coordinating and dedicating its shared resources so that the deficiencies from past generations are being corrected and the survival of mankind on the planet is assured.

The influences of the future study's key forces appear in Table 2:

Scenario 3: Death by 1,000 Cuts

Petty bickering among liberal and conservative political parties in world governments led to significant delays in developing a collaborative global approach to the pressing, population-driven, anthropogenic changes in climate. Continual questioning of scientific methods and interpretation of data has led to arguments about the meaning of the symptoms, sources of chemical pollutants, and key interrelationships among various factors. Furthermore, the reality of solar pacification finally struck home after four years of rapidly decreasing temperatures coupled with negligible sunspot activity. Although this convinced politicians that action was required, the change process was inhibited by a breakdown in political will.

While time was invested to convince all constituents that they must be active in the change, the following developments occurred:

- At first, the global population continued to grow beyond the level of sustainment, reaching 10 billion inhabitants. At that point, the population stabilized to the rate of replacement.
- Global drought from climate change exacerbated the short food supply, and famine became widespread among both developed and developing countries.
- Food distribution systems were no longer able to support the dense population centers in megacities or the wide population spread in rural areas.
- Riots erupted into mob violence in megacities as criminal gangs took over distribution of the new drugs of choice—milk, bread, and eggs.
- Governments called for the military to manage food distribution across the 600 global megacities, and citizens migrated to the countryside in desperate search of food and water.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Table 2: Influences of Key Forces on Scenario 2: Resource Restoration

Key Force	Nature of Its Influence on This Scenario
Global Responsibility	<ul style="list-style-type: none"> • Regionally-based geopolitical alignment exists in all areas of the world. • United Nations coordinates actions of leading developed nations that oversee less-developed nations, following the European Union and Organization of American States examples. • A “global democracy” may be the ultimate objective for mankind, but lessons learned in the “Arab springtime of democracy” will affect its nature. • Regions are more likely to be influenced by policies that affect their immediate neighbors than those intended to affect the entire world.
Consumer Awareness	<ul style="list-style-type: none"> • Consumers have become aware that their buying criteria must include not only performance and quality but also the environmental impact of their purchases. • Consumers flock to the Internet to determine the environmental impact of their personal purchases of “durable goods.” • Internet information shapes their personal buying trends. • Business-to-business procurement follows the consumers, leading to a “go green” campaign that increases sensitivity to the environmental impact of the entire supply chain.
Globalization	<ul style="list-style-type: none"> • Mankind has come to grips with the global ecosystem and the interconnectedness of national, regional, and global infrastructure. • Commitments have been made to work together across boundaries to address and resolve regional and global problems. • A regionalized division of the UN has created spheres of influence for all major geo-political areas, eliminating typical political posturing for leadership and “equal rights” with respect to decision making. • Brazil has taken the role of influence-shaper for South America, China for Eastern Asia, India for the Middle-East, Russia for Central Asia, and the EU and America continue their traditional roles. • The African Union has increased its political strength and established a close mutually-beneficial relationship with the League of Arab States. • Nations pool their resources and outsource governmental activities that can be consolidated. • “Cloud computing” services have reduced the cost of local investment in information technology infrastructure and the human capital investments required to manage common governmental services.
Increasing Rate of Change	<ul style="list-style-type: none"> • Global leaders have grasped the need to manage some forms of change. • Control of new products no longer involves patent law for protecting intellectual property. • Instead, laws focus on controlling production of durable goods by granting licenses to use new technology but only when consumption of natural resources is required. • Cloud computing has led to standardized computer systems, more natural software migration paths, and less end-user anxiety as changes occur. • Human systems and processes are more stable and reliable, delivering expected outcomes. • Changes are tested and approved fully by users prior to implementation, rather than foisted upon mankind by producers. • Power in production management has shifted toward customers.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Table 2: Influences of Key Forces on Scenario 2: Resource Restoration (continued)

Key Force	Nature of Its Influence on This Scenario
Workforce of the Future	<ul style="list-style-type: none"> • Literacy goes beyond basic education in reading, writing, and arithmetic and now includes systems, statistics, and quality as an advanced level for global citizens. • Workers can become either a “certified production worker” or “certified service provider,” by mastering and demonstrating entry-level proficiency in both theory and application of these core job competencies. • Developmental pathways for workers of the future are less functionally constrained. • Individual development plans foster personal growth from the apprentice level to the craftsman level in all recognized work disciplines and vocations. • Performance at each higher skill level leads to both economic benefits and esteem (recognition) for workers.
Aging Population	<ul style="list-style-type: none"> • Senior citizens have become elder statesmen and mentors, leveraging their knowledge and experience to resolve problems associated with the “me-first” trap of runaway consumption. • The elders are teaching mankind the benefits of austerity and stewardship of natural resources, which is based on the fundamental principles of all organized religions in the world and causing people to examine more carefully “what unites us” rather than myopically focusing on “what divides us.”
21st Century Quality	<ul style="list-style-type: none"> • Business excellence, Lean production, standards conformity, Six Sigma, and other quality-oriented communities have merged to create a more coherent approach. • Application of all the quality sciences and practices now is focused on a common goal for the benefit of mankind—improving the global quality of life. • Centers of quality competence (e.g., reliability, statistics, auditing, etc.) support communities of practice (e.g., healthcare, education, government, industry, service, etc.) and coordinate the use of best practices across organizational and regional boundaries.
Innovation	<ul style="list-style-type: none"> • Technology firms have set a new standard for cross-company cooperation through “collaborative engineering.” • Collaborative engineering consortia pool their technological prowess and intellectual property for the benefit of entire industries. • Governments recognize the value of this resource efficiency by providing significant tax incentives for completed projects that are approved by cross-industry consumer panels. • Development of environmentally-friendly technical solutions has become the imperative, forcing a wartime response requirement for focused technical breakthroughs. • Research and engineering now are required to innovate “on demand,” generating continuous and systematic improvement. • Innovations must resolve focused problems effectively, efficiently, and economically.

Prognostications: *Scenarios of the Future as Viewed in 2011*

- Developing countries with agrarian economies increased their value as global partners while world-leading countries scrambled to protect their economies.
- Rigidly polarized political positions caused delays in making decisions and implementing technical solutions, so the world fell behind the power curve for corrective action.

It now appears that the ecological imbalance in nature may require a century or more for restoration. Although repairs finally have been initiated, humanity will suffer through the long recovery period. Widespread panic instigated many parallel actions to improve the situation, but systemic quality tools were not used to improve the environmental operation continuously. It was a case of too little, too late, and without the proper focus.

How did the key forces affect this scenario? Table 3 provides a summary of their involvement.

Scenario 4: Past the Tipping Point

The world's ecological systems suffered a cataclysmic collapse due to man-generated pollution. The ozone layer, previously saved from chlorine, is now under attack by methane. Unchecked increases in the density of carbon dioxide and nitrous oxide have accelerated the warming effects of the other greenhouse gases. The brief respite generated by a period of solar pacification that lasted less than a decade provided an excuse for naysayers to delay addressing the global warming problem. The subsequent events were disastrous, as described below:

- The thermal readjustment occurred so swiftly and was so significant that scientists were unable to thwart a global meltdown of the polar ice caps and all major mountain glaciers. This raised the ocean surface approximately one meter, adding even more pollutants to the ecosystem.
 - The resulting acidification of the oceans caused the loss of major fisheries and coral reefs around the world.
 - Coastal residents fled to temporary homes on higher ground.
- The population had grown to 10 billion inhabitants, but it rapidly fell to less than six billion. The lack of a speedy and effective human response created global chaos, including war, plagues, famine, and pandemics.

At this point the future appears grim. Mankind has taken a quick, giant step backward toward the Stone Age, and Earth's biodiversity has been reduced to a fraction of its pre-pollution era. The ability for the planet and society to recover remains uncertain. Sadly, the survivor instinct that now exists inhibits the close global cooperation necessary to resolve these issues effectively and efficiently.

The key forces described in Table 4 interacted to generate this "doomsday" scenario.

Leadership Through Quality is Required to Improve the Future

An important lesson learned when considering these scenarios is that prognostication does not assure that we ever will possess the "correct" view of coming events. This is true for two reasons. First, the data available does not lend itself to full knowledge. Second, what knowledge we can gain is at best a probability with a high degree of uncertainty; the relationships among the factors are a complex "mess" that represent a truly "wicked problem" (Rittel & Webber, 1973, Vol. 4, pp. 155-169). Solving problems of this nature requires intense cross-disciplinary collaboration. As noted organizational theorist Russ Ackoff so aptly phrased it, "So much time is currently spent in worrying about the future that the present is allowed to go to hell" (2006).

The choice of an appropriate action plan should be built on facts and data, following a classic approach to quality: learning about the process, observing facts, analyzing data, and making estimates about performance. This has been the historical strength of quality analytics. Performance measurement is both a science and an art; however, its focus on observational knowledge can take us only so far in the face of a wicked problem. We need to consider our predicament from both a data perspective and as a complex systems problem.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Table 3: Influences of Key Forces on Scenario 3: Death by 1,000 Cuts

Key Force	Nature of Its Influence on This Scenario
Global Responsibility	<ul style="list-style-type: none"> • Mankind has been globally irresponsible for many centuries and lackadaisical inertia is endemic. • Delayed action resulted in increased pollution and enhanced the negative effects of climate change. • Shock therapy was needed to reverse this historical trend and focus popular opinion on addressing issues that require unpopular choices. • The net effect is a renaissance of positive global socialism—“global goodness”—that cuts across religious, racial, and cultural barriers. • Developing security in livelihood for all of mankind is the new focus.
Consumer Awareness	<ul style="list-style-type: none"> • Consumers’ awareness has increased, but purchasing choice options have diminished; dependability of core functions at the best price point has become the emerging definition of “exciting quality” in products. • Market pricing does not tolerate the cost effects of poor design processes or waste in materials or operations. • Customers require assurance that products will last for the advertised lifetime. • Reliability, rather than overly aggressive marketing promises, drives this marketplace.
Globalization	<ul style="list-style-type: none"> • Globalization has begun to shrink in focus; regionally based collaboratives, based on negotiated positions among national members, are prevalent. • Nations were unable to build a “global cohort,” so they initially focused on increasing their standard of living through consumer-based development, but this self-centered approach collapsed as global supply chains disintegrated. • Businesses then transitioned to crisis-mode operations, which had a hugely negative effect on both national and global economies. • As enlightenment dawned, people began to realize that what adversely affects any of us adversely affects all of us. • Recognition that true democracy requires a global distribution of wealth that is sufficient to assure equitable quality of life for all people led to an understanding that global economics cannot be played as a zero-sum game with the world divided into “haves” and “have nots.” • A new basis for economics was born on a global scale—a capitalist Marxist blending that generated a holistic economic system for the good of all people.
Increasing Rate of Change	<ul style="list-style-type: none"> • Climatological systems reeled through major cycles of change; this caused random and radical reactions, rather than traditional linear or exponential responses. • These changes have driven all of the man-made processes and economic forces into reactive modes. • Global decisions were based on selective perceptions, which further randomized the world system’s responsiveness. • Constituencies jockeyed for better positions to obtain their fair share of the limited available resources. • The world was a mess and changed from minute to minute—change became synonymous with chaos. • World leaders finally recognized that they needed to modify many global behaviors to repair the Earth’s natural, economic, and social infrastructure. • Daily management systems and the application of control theory have replaced the focus on evolutionary and revolutionary change in conjunction with the global desire for stability and control.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Table 3: Influences of Key Forces on Scenario 3: Death by 1,000 Cuts (continued)

Key Force	Nature of Its Influence on This Scenario
Workforce of the Future	<ul style="list-style-type: none"> • Risk management and control methods have emerged as the critical leadership skills. • Proficiency in the use of data, measurement, monitoring, and analysis now is required for workers as they support daily management systems. • Process-management and statistical-thinking fundamentals are a core learning requirement. • Multidisciplinary teams working on cross-functional tasks are much less homogeneous, which requires greater interpersonal skills to reach consensus; the value of diversity is truly appreciated.
Aging Population	<ul style="list-style-type: none"> • The global famine and related epidemics affected both the aged and infant populations disparately because they were more vulnerable to health risks. • The world lost a generation of senior citizens and their collective wisdom during the times of strife and turnaround. • Environmental euthanasia offset the imbalance caused by the factor related to the aging population.
21st Century Quality	<ul style="list-style-type: none"> • Quality has been restricted to micro-economic applications rather than to benefit the world's social system. • New product development is the principle application arena of the quality sciences and provides assurance of product reliability. • Emotive politics overcame the rational decision processes promoted through total quality management. • An independent mediator board of sages validated the science used to make the critical decisions for environmental resurrection. • Quality professionals were accepted as neutral and objective participants in the turnaround process, assuming essential roles as leaders and specialists.
Innovation	<ul style="list-style-type: none"> • Resistance to change has blocked new ideas, and managers now require significant, forecasted return-on-investment for every proposed product. • Innovation, which is synonymous with the development of useful capability, has been stymied under these conditions. • The longer payback periods associated with developing the infrastructure required to recover from past environmental degradation caused government and business leaders to support few innovative environmental technologies.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Table 4: Influences of Key Forces on Scenario 4: Past the Tipping Point

Key Force	Nature of Its Influence on This Scenario
Global Responsibility	<ul style="list-style-type: none"> • Mankind has acted irresponsibly, blindly consuming the Earth’s resources in a never-ending desire for more and better durable possessions. • Fractious behavior and selfishness have prevented timely action and adoption of austere ways to achieve an adequate quality of life for all people. • Nations became insular and assumed isolationist attitudes, generally rejecting the principles of social democracy; cross-national cooperation was negligible. • Global cooperation occurred only when the environmental situation became moribund. • Even then cooperation was laced with mistrust because developing nations remained skeptical regarding the motives of developed nations.
Consumer Awareness	<ul style="list-style-type: none"> • Consumers continued to greater, better, and faster product functionality, highly valuing luxury brands—until the global collapse occurred. • Immediate consumer backlash caused many unreliable luxury brands to lose value and to disappear. • The economy contracted greatly as consumption focused on essential existence of family units. • White-collar workers suffered disproportionately because they did not have anything perceived as valuable to trade in the barter-driven markets.
Globalization	<ul style="list-style-type: none"> • Social, economic, and political systems collapsed in conjunction with the failure of the ecological system. • Megacities were affected most because their infrastructures depended so strongly on external support systems. • Megacities, which had been hubs for global commerce and dialog, became dysfunctional war zones where people fight to survive. • Globalization and cooperation have ceased.
Increasing Rate of Change	<ul style="list-style-type: none"> • When the global collapse occurred, the increasing rate of change stagnated and then reversed into a constantly declining state of degradation. • The climate change has had a drastic impact on life, so humanity now is operating on a survival-of-the-fittest basis, scavenging for the means to exist for another day. • Energy systems, clean water, nutritional food, adequate shelter from increasingly harsh weather, and transportation for moving goods between communities are required to preserve society—as in a war-torn country.
Workforce of the Future	<ul style="list-style-type: none"> • Skills that were once highly valued are worthless in the new “survival-based” economy. • Mankind’s reversion makes skills such as foraging, hunting, fishing, and camping essential; only people who can adapt and live without previous conveniences are able to endure.
Aging Population	<ul style="list-style-type: none"> • Global warming diminished the survival rate of the elderly and the young.

Prognostications: *Scenarios of the Future as Viewed in 2011*

Table 4: Influences of Key Forces on Scenario 4: Past the Tipping Point (continued)

Key Force	Nature of Its Influence on This Scenario
21st Century Quality	<ul style="list-style-type: none"> • Maintaining quality of life and climbing Maslow’s hierarchy to sustain homeostasis at the existence level are the primary purviews for applying quality principles and practices. • Achieving subsistence products and transferring survival knowledge from generation to generation are the outcomes emphasized in quality initiatives.
Innovation	<ul style="list-style-type: none"> • Structural innovation has been set aside in favor of essential, local innovations that are both necessary and sufficient for assuring the basic qualities of life. • Innovation, as a factor in improving the condition of mankind and the planet, has become passé; the value system supporting that socially-focused approach, has died.

In the book, *The Functions of the Executive* (1936), Chester I. Barnard described a hierarchy of data types in terms of the certainty of knowledge that is produced. His hierarchy categorized data from most to least tangible in terms of certainty. The top of the scale reflected physical, biological, and process data, the most certain observations. The mid-range involves economic data that represent approximations using probability estimates. Intangibles such as political, social, and moral data comprise the low end of the hierarchy. Interestingly, the environmental data factored into the futures study is the most tangible and certain information used. Associated economic outcomes have a high degree of uncertainty and fall into the mid-range. The least confidence can be placed in the intangible data sources.

The irony here is that these less certain data types are all drivers of the decision-making process that leads to consensus and affects the economic development outcomes. Science can lead us to consider outcomes for society, but the projected economic ramifications are quite uncertain. Even more uncertainty originates in the decision-making process that take into account the multitude of political, social, and moral issues generated by the plurality of the human race. The distinctive differences in the way nature works and people think exacerbates the challenge of addressing such wicked problems.

Wicked problems are highly complex and include social and/or economic interactions that inhibit them

from being solved completely. They are systemic; there are no easy, direct answers that resolve them—despite the perception that somebody must know its answer. We are misguided in our thinking that finding an expert to help us define the problem better will lead to its solution.

Furthermore, wicked problems are entangled, interacting with other events and situations in a way that drives change in unanticipated directions. These unintended consequences are tied directly to our limited experience and knowledge, which undermines our ability to understand the potential ramifications of the decisions being made. When we decompose a wicked problem to understand it better, we unwittingly mask the eventual unknown and unobservable systemic effects.

All of the scenarios described in the futures study constitute wicked problems. Why are we faced with that situation? Chemical and biological systems have interacted with human systems to create the problems we face today. The natural tendency of people to try to improve the quality of their lives exacerbates this situation.

Numerous factors influence the problem, including population growth, urban sprawl, rapid acceptance of technological advances, the relative disparity in economic well-being (from exceptional affluence to extreme poverty), and humanity’s conflicting desires of altruism and self-interest. There is no value to assigning blame for this situation, but it is mankind’s obligation

Prognostications: *Scenarios of the Future as Viewed in 2011*

to solve the problem—despite the reality that simple answers are not likely to be effectual. Journalist Henry L. Menken (1917) said, “There is always a well-known solution to every human problem—neat, plausible, and wrong.” Instead of becoming bogged down in the “root-blame-analysis” game we must focus our best efforts on solving these problems that threaten our existence.

To succeed with this vital mission, the following components are essential:

- *Our best scientific knowledge and theory must be combined with an ongoing effort to investigate and control the causes of problems.* Just controlling the resultant effects will not prevent acceleration of these wicked problems and is likely to lead to a real-life situation that is closer to the doomsday scenario than the utopian scenario.
- *A universal approach must be adopted.* This is a global problem that involves all of the governments of the world, and global coordination is required. This implies that the United Nations must play a pivotal role, pursuing two areas on its global agenda: good governance and global sustainability.

Good governance is necessary to coordinate the necessary human actions effectively and efficiently. It is described using these eight characteristics: participatory, consensus-oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive, and follows the rule of law. Systems of this nature minimize waste, abuse, and corruption. They also take into account the concerns and rights of minorities and society’s most vulnerable members when making decisions (UNESCAP, n.d.). These attributes openly invite quality to become a critical enabler of the required global transformation.

Sustainability is the capacity to prolong the planet and human life. Global actions require that personal opinions, expert assertions, and political positions that typically are accepted as facts be coordinated. Sustainability requires “development that meets the needs of the present without compromising the ability of future generations to meet their own need” (World Commission on Environment and Development, 1987). It balances global aspirations

for a better tomorrow with the need to manage and preserve the life-support systems of our planet.

In his Tallberg Lecture (2006), Ackoff emphasized the fundamental concept of sustainability, “I see little evidence that international programs currently directed at producing development know what development is. Development is not the acquisition of wealth, an increase in the standard of living, as they assume. Standard of living is an index of growth, not development. Quality of life is an index of development. Development and growth are not the same thing.” To understand what is meant by sustainable development, we must come to grips with the meaning of quality and define it for the coming age, much as Robert Pirsig did in his classic novel, *Zen and the Art of Motorcycle Maintenance* (1984).

In the face of these threats, mankind must focus on how to alleviate these wicked problems through coordinated human action (healthcare, agriculture, engineering, etc.). If we remain open to discovery of the unknown and explanations for the currently inexplicable, science will help us unravel life’s mysteries. The concepts and tools of quality must have a definite role in the scientific process. Involvement of the quality profession is the only suitable option.

If we think differently and adopt a systems approach, we are likely to act more decisively to resolve today’s wicked problem—this mess exists because we have relied too long on outdated thinking, methods, and tools. We must help to create a world where science informs and instructs policymakers. We must use our best thinking to develop a course of action that is based on data, analysis, and scientific discovery, rather undependable and uncertain politics. It is now time for ASQ to respond to the implications of these scenarios and devise a way for the global quality community to respond collaboratively.

References

- Ackoff, R. L. (2006). Thinking about the future and globalization, *Proceedings of the 25th Annual Tallberg Forum*.
- American Astronomical Society, Solar Physics Division media teleconference 1100 MDT, 14 June 2011.

Prognostications: *Scenarios of the Future as Viewed in 2011*

AtKisson, A. (1999). *Believing Cassandra: How to be an optimist in a pessimist's world*. White River Junction, VT: Chelsea Green Publishing.

Barnard, C. I. (1936). *The functions of the executive*. Boston: Harvard.

Butler, J. H. (2010). Retrieved from <http://www.esrl.noaa.gov/gmd/aggi/>.

Canton, J. (2011). The extreme future of megacities, *Significance*, 8:2, 53-56.

Environmental Protection Agency, *Inventory of U. S. greenhouse gas emissions and sinks, 1990-2009*, 15 April 2011, downloaded from <http://www.epa.gov/climatechange/emissions/usinventoryreport.html>.

Lempinen, E. W. (2010). Experts urge renewed research to meet global food needs, *Science*, Vol. 329, 30 July 2010, p. 527.

Luterbacher, J., Dietrich, D., Xoplaki, E., Grosjean, M., and Wanner, H. (2004, March 5) "European seasonal and annual temperature variability, trends and extremes since 1500," *Science*, 303:5663, pp. 1499-1503.

Meadows, D. H., Meadows, D. L., Randers, J., and Behrens, W. W. III (1972). *The limits to growth*, White River Junction, VT: Chelsea Green Publishing.

Meadows, D. H., Meadows, D. L., Randers, J. (1992). *Beyond the limits*, White River Junction, VT: Chelsea Green Publishing.

Meadows, D. H., Randers, J., and Meadows, D. L. (2004) *Limits to growth: The 30-year update*, pp. 181-202. White River Junction, VT: Chelsea Green Publishing.

Menken, H. L. (1917, November 16). "The Divine Afflatus," *New York Evening Mail*.

National Academies (2008). *Understanding and responding to climate change*, Washington, DC.

NOAA (2010, July). State of the climate in 2009, *Bulletin of the American Meteorological Society*, Vol. 91. Retrieved from <http://www.ncdc.noaa.gov/bams-state-of-the-climate/2009.php>.

Pirsig, R. M. (1974). *Zen and the art of motorcycle maintenance: An inquiry into values*. New York: Harper.

Rittel, H. & Webber, M. (1973). Dilemmas in a general theory of planning, *Policy Sciences*, Vol. 4, pp 155-169, Amsterdam: Elsevier Scientific Publishing Company, Inc.

Schwartz, P. (1991). *The art of the long view: Planning for the future in an uncertain world*, New York: Doubleday Currency.

UNESCAP. What is good governance? Retrieved from <http://www.unescap.org/pdd/prs/ProjectActivities/Ongoing/gg/governance.asp>.

Wikipedia (n.d.). Retrieved from http://en.wikipedia.org/wiki/Volcanic_Explosivity_Index.

World Commission on Environment and Development (1987). *Report of the Brundtland Commission: Our common future*. London: Oxford University Press.

Additional Reading

Friedman, T. L. (2006) *The world is flat: A brief history of the twenty-first century*, Release 2.0. New York: Farrar, Straus and Giroux.

Friedman, T. L. (2008) *Hot, flat, and crowded: Why we need a green revolution and how it can renew America*. New York: Farrar, Straus and Giroux.

Greenspan, A. (2007) *The age of turbulence: Adventures in a new world*. New York: Penguin Books.

Taleb, N. N. (2007) *The black swan: The impact of the highly improbable*. New York: Penguin Books.

Author's Notes

1. The Kyoto Protocol implements the international environmental treaty, the United Nations Framework Convention on Climate Change (UNFCCC), for stabilizing greenhouse gases in the atmosphere.
2. Under the Clean Air Act, the Environmental Protection Agency (EPA) monitors the air quality level of six airborne pollutants: nitrogen dioxide (NO₂), ozone (O₃), sulfur dioxide (SO₂), particulate matter (PM), carbon monoxide (CO), and lead (Pb). Data from 4,000 instruments distributed across the United States are maintained in the AirData statistical and mapping database (<http://www.epa.gov/air/data/index.html>). This information may be accessed for researchers or the public to conduct their own studies of air quality for a local, regional, or national geographic area.
3. The strongest volcano during the last century was the eruption of Mount Pinatubo (Luzon, Philippines) in 1991, which measured six VEI. The Mount St. Helens, WA, eruption of 1980 was measured at five VEI.
4. The Delphi study conducted by ASQ in 2010 engaged 119 global quality professionals to discover their insights into what is driving change and developed a consensus position. Of the participants in this study, 59 were members of the International Academy for Quality.

The author would like to thank Deborah Hopen for her valuable contributions in editing this report.



Emergence

2011

Future of Quality Study



The Global Voice of Quality™

Introducing

Emergence



Decision Making Now and Tomorrow

James J. Rooney
ASQ Chair

Risk assessment and risk management are daily activities for decision makers. Often, decisions regarding risks must be made under uncertain conditions and without the best possible information. This uncertainty of the future is one of the main marks of the human condition. It taints all manifestations of life and action.

The ASQ Future of Quality Study provides intelligent decision makers with good information based on a multitude of factors and the interests of numerous communities. The use of this study as an input to risk-based decision making will help people make better, more logical choices. A good decision made quickly is much better than a perfect decision made too late. On average, and over time, good decisions made using the Future of Quality Study should provide the best outcomes.

The Future of Quality Study structures and presents the 2011 forces of change to better facilitate decisions and focus actions. It provides critical input to the decision-making process by clarifying tradeoffs, consequences, uncertainties, benefits, and risks so that decision makers can make more informed choices. Decision makers can identify high-risk areas and develop risk management approaches to reduce the risks associated with the future state of their enterprises and communities.



“Information is
the currency of
democracy.”

— Thomas Jefferson

Good decisions
made using the
Future of Quality
Study should
provide the
best outcomes.

table of contents

2 Introducing Emergence

- 3 Decision Making
Now and Tomorrow
Jim Rooney, ASQ Chair

5 Welcome to Emergence

- 6 Emergence and the Future
Paul Borawski, ASQ CEO
- 9 Methodology and
Acknowledgments

12 2011 Future of Quality Study

- 13 Forces of Change
- 17 Scenarios
Greg Watson, Chairman,
International Academy for Quality
- 26 Implications

29 Further Emergence

- 30 The Course of Change
Over Time
Deborah Hopen, President,
Deborah Hopen Associates Inc.
- 33 Looking to the Future
From the Rearview Mirror
- 36 The Future of
Organizational Quality
Harry Hertz, Director, Baldrige
Performance Excellence Program
- 38 Toward a Definition of Quality
- 41 Postscript
David Luther, ASQ Past Chair

42 Toward Action

ASQ

is a global community of people passionate about quality. Members of the community gain access to unparalleled resources and a knowledge network that links the best ideas, tools, and experts to make our world work better.

Welcome

to Emergence



Emergence and the Future

Paul Borowski

ASQ CEO

When the ASQ project team met to discuss a theme for the 2011 Future of Quality Study, EMERGENCE got the nod. It's a fine term, but what exactly does emergence mean? It was a question all of us in the room had. Where to look first? I went to my long-valued, tattered, and worn *American Heritage Dictionary* (quote to the right). Since my dictionary is 35 years old I felt I should consult a recent resource to see if the definition has changed. Did I search for a printed dictionary with a 21st century copyright? Of course not. I went to the Internet (which, if it were a word in 1976, would have been found between Internet and internist). The first link was to Wikipedia and there, along with a definition, (to the right) was a small ebook on the topic, along with links that would have engaged me for the afternoon.

I doubt executives at Houghton Mifflin Company (publishers of the *American Heritage Dictionary*) imagined that the ARPANET (1969) would become the Internet (1971) and that the personal computer (1974) would put the World Wide Web (1980) at our fingertips. I doubt Wikipedia (2000) founder Jimmy Wales dreamt about it as a child. Nor did little Jimmy imagine tweeting (2006), although Jack Dorsey may have taken a queue from "texting" (1992, Neil Papworth), which was limited to 160 characters.

The point is our world is changing. The way it changes is becoming increasingly less predictable. In the mix of this unpredictable change we make our way through life. We work for organizations whose survival rests on someone's ability to traverse this sea of change—desperately trying to keep expenses less than revenue.

No matter how unpredictable the future may be there is still advantage to those who get a jump start on the rest of us. There is a premium of anticipating the future and getting there first. Often the premium is remarkable. But how do we anticipate the future if it's increasingly unpredictable? One way is through futuring and scenario development. If you have an urge to consult your dictionary for a definition of futuring, there's no need to—it's not there yet.

Futuring

In simple terms futuring is about enhancing your ability to anticipate the future in a way that's both focused and expansive. Yes, both. It's focused in that the first step in futuring is identifying the forces most significantly affecting the future of any topic of interest. The second step is to challenge yourself to expand your consideration of the future under various scenarios. Good news scenarios. Bad news scenarios. Business as usual scenarios. I refer to this step as "increasing your bandwidth" on what the future may hold. The third step in futuring involves postulating the implications of the



"Emergence:

The unpredicted appearance of new characteristics or phenomena in the course of social evolution."

—American Heritage Dictionary, 1976

"In philosophy, systems theory, science, and art, **emergence** is the way complex systems and patterns arise out of a multiplicity of relatively simple interactions. Emergence is central to the theories of integrative levels and of complex systems."

—Wikipedia 12:30 p.m. (CDT) September 21, 2011

various scenarios on your future. In other words, what would you do in response to a given scenario? Anything you would do is something you can build as a core strength. Responses that vary by scenario lay in waiting until that scenario begins to present itself. But at that point you have already pre-thought your response and can lead, change, and act (step 4 in the process) with confidence and ability.

Four Steps to Futuring

- Step 1: Identify the forces of change.
- Step 2: Develop scenarios of possible futures.
- Step 3: Explore the implications.
- Step 4: Lead. Change. Act.

ASQ's History of Futuring

ASQ began this process of futuring in 1995 when ASQ Past Chair, David Luther, a senior executive at Corning, (see p. 41 for his insight) introduced the concepts along with a book, *The Art of the Longview*, by Peter Schwartz (Currency Doubleday, 1991).

ASQ conducted its first Future of Quality Study in 1996 and has repeated the study every three years. True to theory, change is accelerating and in unpredictable ways. But within the bandwidth of the scenarios that were developed came valuable implications. Implications to quality itself—what quality is and what it means. Implications to the practice of quality in organizations and communities. Implications to the professionals mastering the concepts, techniques, and tools to lead quality initiatives—and create the next generation of practices. Finally, implications to ASQ in our continued desire to become ever more relevant to our members and the quality community.

Predictive Validity?

In the section “Looking to the Future From the Rearview Mirror,” the 2011 panel of experts describes the recent history of quality. It’s clear that quality has been dynamic in response to the forces of change. Quality is not today what it was in 1996, or even 2008 for that matter. Those who lead the practice of quality are leading change and finding themselves moving up the strategic ladder and making a huge difference in their organizations. Others are struggling to understand why their trusted tools don’t work as well as they once did.

Take any one of the trends identified and apply them retrospectively to the past as strategies to the present, and I

think you’ll find the response of leaders was aligned with the forces, scenarios, and recommendations in the implications. I’ve been around long enough to know that correlation does not prove causation. However, that doesn’t stop me from taking some comfort in the validity of the study to anticipate the changes the community would indeed embark on in response to the forces of change.

Trends in the Practice of Quality

- A larger role for quality in strategy
- Enterprise quality
- Expanding complexity and scope
- From product/service-centric quality to experience-centric quality
- Quality culture
- Waste reduction
- Quality in every field of endeavor
- New roles for the quality leader

Using the Study

Many studies are about answers. This study is not. It is about focus, exploration, and broadening your consideration of the future. The 2011 Future of Quality Study is about provoking questions about what you want to do in anticipation of the future. Answering those questions makes you agile. Getting to a state of agility requires good thinking and, more importantly, good dialogue.

Over the next three years ASQ will host dozens of “stakeholder dialogues” where we will invite members and others to join us in conversations about the future of quality. The forces, the scenarios, and the implications from this study are seeds for the conversation but do not create limits. We will host these conversations all over the world and from each conversation we will capture the wisdom of the participants. Conversation by conversation we will see patterns begin to emerge that give us insights into the most pressing issues that need to be addressed. From those patterns and themes, ASQ’s board will consider its strategic response. But that’s just ASQ’s use of the study.

Organizations will also find this study of use. ASQ encourages and will support organizations that want to use the study to explore the implications for themselves. ASQ will host a conversation in exchange for the benefit of understanding the implications from the organization’s distinct point of view. Company by company, school by school, community by

community, hospital by hospital, we gain insights, share thoughts, and set change in motion.

And we never conclude a conversation about the future of quality without pointing out the third critically important customer of the study—you. Anyone wondering about future career skills needed and opportunities arising will find direction in this study and find wisdom in the conversation.

Raise the Voice of Quality

The quality community has a big job to do. Too often I run into executives who learned what they know about quality a decade or more ago. They often hold product-centered notions of quality. This is out-of-date thinking.

The quality community must raise its voice and say, “Through quality all of our goals can be realized.”

Quality is not an accident and comes from more than good intention. Quality can’t be taken for granted. When the importance of quality is reduced in any way, processes fail to work, mistakes are made, and we will all pay for that day of reckoning.

Contributors

The Panel

More than 140 people from 33 countries started out on this study together. You’ll see their names and affiliations on pages 10-11.

Noted Experts

Greg Watson has been writing the Future of Quality Study scenarios since 1999. Greg is unique in his ability to do so. Not only does he understand the purpose of the scenarios, but he also devotes an incredible amount of time to supporting research. In addition to the scenarios contained here, Greg wrote a larger research piece, “Prognostications: Scenarios of the Future as Viewed in 2011.” The report was published by the International Academy for Quality. Greg serves as IAQ’s chair. I recommend the whole research report to you. Greg is a past chair of ASQ. View Greg’s report at asq.org/2011/09/global-quality/prognostications-scenarios-of-the-future-as-viewed-in-2011.pdf.

Deb Hopen is the editor of *The Journal for Quality and Participation* and has many gifts including her ability to see the bigger picture. I invited her to review the forces of all six of the studies to determine if there were larger trends at work. You may also enjoy the fall issue of *JQP* which features the Future of Quality Study. Deb is also a past chair of ASQ.

Harry Hertz directs the Baldrige Performance Excellence Program for the U.S. Department of Commerce at NIST. Harry joined the Baldrige program in 1992 and has directed it since 1996. Harry is a keen observer of enterprise management practices and has interesting insights to share about how the forces of change will impact enterprise management.

David Luther initiated the first Future of Quality Study in 1995 when he was ASQ’s chair. He has been a member of the panel for each of the studies and an astute commentator on the future. Dave’s career has included 32 years at Corning Incorporated, where he served in many capacities, including senior vice president and corporate director of quality.

The Research Team

Beth Christensen and **John Van Slyke** joined me in the work of conducting the research. Beth runs the study and the supporting technology. I entered in to help make sense of the panel contributions and directed the line of questioning. John joined in the sense-making stage of the study, pouring through the implications stage and the pages and pages of contributions offered. He also helped make sense of my prose, which can be challenging.

Future of Quality Study Methodology

Identifying the forces shaping the future of quality necessitates the contributions of thought leaders, executives, and global representation. ASQ began the process in January 2011, by electronically inviting more than 270 individuals from all major sectors of the global economy, ASQ WorldPartners, International Academy for Quality members, past ASQ medal winners, ASQ Enterprise members, and recommendations from the quality community. Invitations were extended through the duration of the study.

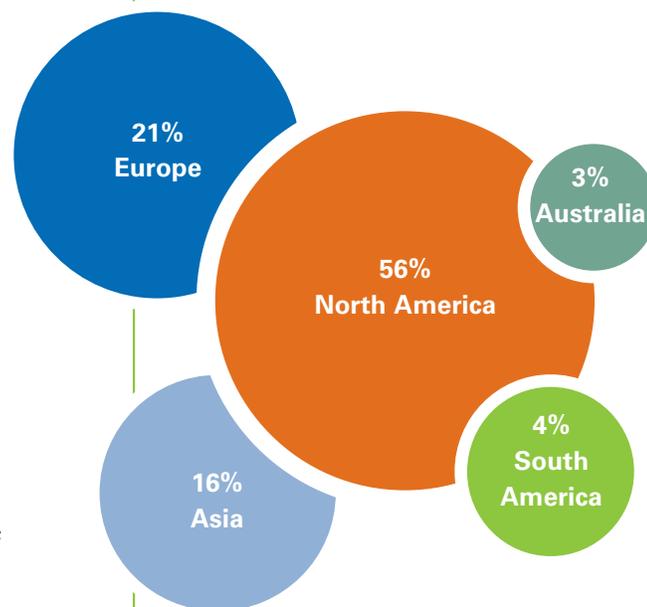
Using the definition of a “force” as, “a powerful change or trend in a social, political, technological, or behavioral area that will impact people’s lives,” ASQ prepared for the study by scanning a number of available reference sources and past studies for trends. Of those selected, 43 were used to seed the study. ASQ employed the Delphi technique, a systematic, interactive method that relies on a panel of experts. The collective wisdom of the group converges toward a consensus on forces that are shaping the future of quality. James Surowiecki’s book, *The Wisdom of Crowds*, lends credence to this approach (Doubleday 2004).

Panelists were asked to electronically log in and select 10 forces that he/she felt were most likely to shape quality in powerful and forceful ways. For all intents and purposes, “quality” was not defined and “the future” was projected 15 years ahead of the current time. Panelists were also asked to state why a particular force was chosen and were given the opportunity to combine forces, suggest new forces, and note patterns.

Panelists repeated this electronic process in three successive rounds through the month of March. After each round, the list of forces was updated and participants were provided with a document containing the anonymous explanations of why forces were chosen. This was to inform them of the thinking of other panelists for the next round.

In the final round, panelists were asked to select up to 10 forces and rank order them. While unconventional, panelists were asked to use 10 to indicate the most significant force, 9 the second most significant, and so on. This aided in the analysis of the relative strength of the ranked forces. Again, panelists were asked to explain their reasoning for their selections. As a result of the rank order process, ASQ determined the 2011 list of eight forces affecting the future of quality.

More than 140 individuals participated, representing 33 countries. A breakdown of panelist demographics is as follows:



The panelists were 81% male and 19% female.

Global economy—
Service: 37%
Nonprofit: 21%
Manufacturing: 19%
Education: 17%
Healthcare: 5%
Government: 1%

2011 Future of

Don Abbey, CareFusion	Kirby Drysen, Cisco
Sal Agnello, ASQ	Grace Duffy, Management & Performance Systems
Niyazi Akdas	Allan Ebedes, National Quality Institute
Bjørn Andersen, NTNU Department of Production and Quality Engineering	John Elkington, Volans
Pete Andres, The Boeing Company	Connie Faylor, Ben Franklin Technology Partners
Juhani Anttila, Sonera Corporation	Elizabeth Martinez Flores, Toyota Motor Manufacturing of BC
Carol Armstrong, Northrop Grumman	Sergio Foguel, IAQ
Dennis Arter, Columbia Audit Resources	Kevin Foley
Ron Atkinson	Joe Fortuna
Charles Aubrey, Anderson Pharmaceutical	John Fowler, ASQ
Asbjørn Aune, Norwegian University for Science and Technology	Thomas Friedli, Institute for Technology Management
Richard Bankowitz, Premier Inc.	Miflora Gatchalian, Quality Partners Company Ltd.
Chris Bauman, ASQ	Blanton Godfrey, North Carolina State University
Bo Bergman, Chalmers University of Technology	Hope Gonzales, Abbott Laboratories
Clem Bezold, Institute for Alternative Futures	Eduardo Guaragna, PGQP
Maureen Bisognano, Institute Healthcare Improvement	Rudy Hacker, Intel
Paul Borawski, ASQ	Stephen Hacker, Transformation Systems International LLC
Roman Boutellier, ETH Zurich	Benito Flores Hernandez, ASQ Mexico
Maryann Brennan, Brennan Worldwide	Nancy Hernández, Hewlett-Packard Centro Servicios Globales
Cornelia Butnaru, RO Quality IMS	Harry Hertz, BNQP-NIST
Kenneth Case, Oklahoma State University (Retired)	Roger Hoerl, GE Global Research
Kristin Case, CaseConsults	Steve Hoisington Electro-Motive Diesels Inc.
Enrique Chavez, Caterpillar	Peter Holtmann, RABQSA
Kwai-Sang Chin, City University of Hong Kong	Debbie Hopen, Deborah Hopen Associates Inc.
Kaphong Choi, Korean Standards Association	Yoshinori Iizuka, The University of Tokyo
Marvin Christensen, TQM Systems	J.J. Irani, Tata Sons
Robert Cole, University of California, Berkeley	Roland Jahnke
Debbie Collard, The Boeing Company	A.K. Jain, Quality Council of India
Elizabeth Cudney, Missouri S&T	Eric Janssens, EOQ
Jens Dahlgaard, Linköping University	Wolfgang Kaerkes, DGQ
Wafi Dawood, Dubai Quality Group, United Arab Emirates	Hitoshi Kamikubo, JUSE
Camille De Yong, Oklahoma State University	Hesam Kashfi
Navin Dedhia	Liz Keim, Integrated Quality Resources LLC
Joe De Feo, Juran Institute Inc.	Kay Kendall
Jeroen DeMast, Ibis Uva	Cecilia Kimberlin, Abbott Laboratories
Bill Denney, Quality Texas Foundation	John Knappenberger, ANAB
John Dew, Troy University	Brian Lassiter, Minnesota Council for Quality
Ronald J.M.M. Does, University of Amsterdam	Lou Ann Lathrop, General Motors

Quality Study Panel

Kirby Lehman, Jenks Public Schools

Brian LeHouillier, ASQ

David Luther

Alois Magritzer, AQACI/OZ-Lean Six Sigma-Partners

Michael Marchlik, BD

Ricardo Correa Martins, FNQ

Michael Mason, Bechtel

Michelle Mason, ASQ

Giovanni Mattana

Glenn Mazur, QFD Institute

Bo McBee, HP

Patrick Meehan, DuPont

Janak Mehta, TQM International Private Ltd.

Liz Menzer, Wisconsin Center for Performance Excellence

Stanford Miller, Intel

Silas Todd Minnick, Luminex Corporation

Hassan A. Mohsen, Saudi Aramco

Pal Molnar, HNC for EOQ

Raul Molteni, Molteni & Asociados

Bryan Morgenthaler, UHC

Laurel Nelson-Rowe, ASQ

Thong Ngee Goh, National University
of Singapore

Mike Nichols, Nichols Quality Associates

Senen Pajaro Novoa

Irfan Onay, Turkish Society for Quality

Bob Parent, The Conference Board

Su Mi Park, Lunds University

Sung Hyun Park, Samsung Electronics

Ann Perry, The Dow Chemical Company

Gary Rasdorf, Kohler

N. Ravichandran, Lucas TVS Ltd.

Yury Samoylov, Russian Organization for Quality

Lennart Sandholm, Sandholm Associates AB

Pedro Saraiva, University of Coimbra

Michael Sargent, M.A. Sargent & Associates
Pty Ltd.

Prakash Sathe

Chava Scher, Rafael-ISQ

Herbert Schnauber, Ruhr-Universitat Bochum

Hans Dieter Seghezzi

Viktor Seitschek, Quality Austria

Vineet Sharma, Max New York Life Insurance

Shoji Shiba

Zia Siddiqi, Orkin LLC

Lincoln Chin Guan Sim, Singapore Quality Institute

Madhav Sinha, Total Quality Research Foundation (TQRF)
Canada Inc.

Sunil Sinha

Larry Smith

Robert Smith, Bechtel

Ron Snee, Snee Associates LLC

Lars Sorqvist, Sandholm Associates

David Spong, The Boeing Company (retired)

Kenneth Stephens

John Stine, L-3

Joal Teitelbaum, EEJT-PGQP

Aaron Tong, TQM Consultants Company Limited

Art Trepanier, Lockheed Martin

Albert Tsang, The Hong Kong
Polytechnic University

Fugee Tsung, Hong Kong University of Science and
Technology

Manu Vora, Business Excellence Inc.

Deb Walker, The Dow Chemical Company

Arian Ward

Gregory Watson, IAQ

Mahshid Yazdanpanah, Institute of Quality Engineering

Ray Zielke, ASQ

Klaus Zink, University of Kaiserslautern

2011

Future of Quality Study



2011 Forces of Change— Shaping the Future of Quality

What follows are the top eight forces that the panel determined are shaping the future of quality. The narratives paraphrase the perspectives of the panel relating to each force. If you're interested in how the forces of change have evolved over time, see page 32.

1. Global responsibility represents the blending of heightened awareness of the requirement to become more socially responsible with a growing awareness of the global impact of local decisions. Our planet's finite resources are being called upon by a growing percentage of people in the world, and waste that was once economically acceptable is becoming socially unconscionable. The breadth of global responsibility spans governance, human rights, labor practices, fair operating practices, environment, consumer interests, and contribution to society as described by ISO 26000. Global responsibility is a call to ethical leadership at all levels of society—governments, companies, schools, civic organizations, neighborhoods, families, and individuals with an evolving understanding of what being responsible means.

At an organization level, global responsibility embraces growth and profit—it is not philanthropy. Global responsibility appreciates the dual dynamic of being responsible by reducing waste (in all forms*) and the realization of that savings to the bottom line with increased expectations that Web-informed consumers will reward organizations for their responsible efforts with their purchases. Leaders will advocate concurrent improvements in top and bottom lines. Organizations increasingly value their reputations and act to sustain them in the face of crisis. For producers, global responsibility is a complex topic that goes well beyond production efficiency and production waste. It includes responsible design and the obligation for full product life cycle stewardship. Innovation becomes an advocate of sustainability. An innovation without a decreased cost to society will be viewed as irresponsible.

There are increasing expectations that today's global organizations will contribute their problem-solving skills and resources to societal needs out of enlightened self-interest for the longer horizons of business sustainability through a combination of social and organizational strength.

(*Waste—most definitions of waste are limited to the observable aspects of waste—scrap and pollution. Some might include rework (the hidden factory) as a cost of waste. Fully understood, waste includes the cost of addressing dissatisfaction and both the disloyalty of customers and the lost opportunity that dissatisfied word-of-mouth may cost in the reduction of new customers. Future measures of waste may well include the waste of poor use of material in design, the waste of human potential, and the full cost of unethical conduct on the lives of those affected. All these costs and consequences are avoidable and therefore may be considered waste. Another waste is the waste of humanity that comes from undeveloped minds; lives lived without purpose and the lost contributions to society that would come with the full engagement of all people living worthwhile lives.)

At an organization level, global responsibility embraces growth and profit—it is not philanthropy.

2. Consumer awareness is about consumers using their knowledge to make purchasing decisions best aligned with their preferences. Before the Internet, consumption was primarily limited to locally available products and services. Today consumers can “shop” around the world, and they can use Internet knowledge to inform their decisions not simply related to the product/service itself, but also the practices of the company. If the Internet made knowledge *widely* available, social media is making information *instantly* available. Consumer behavior moves at “speed of the electron” pace in both positive and precipitously negative directions. Providers will find themselves needing to respond at similar rates to the collective behavior of customers.

Closely related to the rise of consumer awareness is the ability for consumers to match their requirements and product/service attributes. The organizations that create the greatest flexibility in their ability to create products and services to match customers’ exact wants and needs will be rewarded. Service providers are already headed this direction as they tailor experiences to custom fit their customers. Their databases and the massive databases available to them allow them to capture customer preferences. New flexible manufacturing technologies will soon allow manufacturers to follow similar paths of mass customization. Economical order quantities of one and zero wait times will become the rule.

This force will usher in a new meaning for the customer-focused organization.

3. Globalization is the only force that has been on the study since 1996. It was no. 1 in 2005 and 2008. Earlier studies referred to globalization as the “800-pound gorilla” of forces. Its strength was twice that of the force that followed it on the list. However, what globalization means has shifted since 1996 when globalization meant a huge opportunity for companies that could figure out how to capitalize huge new consumer markets. By 2005, the opportunity of global markets was offset by fear of competition and lower cost labor. What seemed certain by 2008 was that globalization was an irreversible reality whether opportunity or threat. Those who ignored globalization did so at great risk.

Then, as now, the only neutralizing factor, but not strongly measured, was the prospect of local production and a sense of social responsibility to earn a greater share of consumer spending. Why buy produce shipped halfway around the world, even if less expensive, when locally grown alternatives could significantly reduce packaging, transportation, and energy consumption? “Read the packaging” has new meaning in 2011.

Global customers and supply chains occupy a greater share in organizational strategy. Risk and opportunity are huge and executives and governments are reeling in response to issues that are no longer bound by national borders. Complexity has new meaning—or, better said, human minds struggle to make meaning of the complexity they face. If that’s not enough, complexity is certain to increase.

Woven into the opportunity and risk of globalization and the challenges of organizations to manage their enterprises that now cross borders, cultures, and economic developmental stages, are the issues of finite resources.

4. The increasing rate of change was bound to surface as a force of change. In the background of past studies has been the issue of speed. In fact in 1999, when we reviewed the 1996 study’s findings, a common comment was, “the only thing we underestimated was the rate of change.” That factor became known as speed—and in the 21st century technology is the gas pedal.

Like earlier forces, the increasing rate of technological change brings opportunity and threat. High amongst the threats is society’s inability to adapt to the changes foisted upon us by new technology. New technology could create consequences if we fail to look ahead.

On the opportunity side of technology are solutions to world problems. Energy, pollution, fresh water, food, housing, HIV, and cancer all lay on our list of hopes for technological solutions. Without solutions to these problems, our dream that the future can provide our children a quality of life equal or greater than our own is doubtful. If population growth was the driver of economic success in the last century, it will have to slide over as technology takes the wheel in the 21st century. However, technology will be much less predictable a force than population growth. Technology is certain to surprise us in ways that disrupt our status quo.

Futurists are already predicting that nanotechnology will have a more significant impact on our lives than the Internet, and other technologies that we haven’t even labeled will be right behind nano. And don’t count information technology out either. In 2005 a terabyte of storage was nearing \$100 (USD) and was the size of a small handbag. Now two terabytes can be purchased for the same price and the size is not much bigger than a pack of cigarettes!

Product life cycles are short now. Consumer electronics have life cycles of six months or less and will be shorter in the future. Industries will be born, become significant in our lives, and disappear with increasing rapidity. Being first to market will be where the riches will be won. There will be little time, or even market, for second place.

All this speed will require organizations to better anticipate the future and be prepared to respond to the customer’s feedback immediately. The cost of missing a cue from the market, at today’s speed of information sharing, could be disastrous to producers.

5. The workforce of the future will challenge our notions of talent, work, workplace, and learning. While hard to fathom, we're being told unemployment, as we think of it, will become a thing of the past. The number of jobs will soon exceed the number of people available to fill them. Demographers predict organizations will find themselves competing for talent and that competition will move jobs around the globe. High-tech companies already report this reality. This search for talent, along with technological advances, will change the nature and place where work is done, and organizations will grow increasingly flexible in their definitions of work engagements. Those of retirement age will be re-attracted to work with flexible hour arrangements and work that can be done without commuting.

The rapid expansion of information (now doubling every 18 months) and the impact of accelerating technology change will put pressures on organizations to keep their workforces current. Lifelong learning will take on new meaning and the methods of learning will change in response to just-in-time education needs. Organizations will find the need to provide greater considerations of time for learning and larger investments in keeping their workforces current. Counter to the doubling of new information is our ability to forget the wisdom of the past. A real challenge in educating the workforce of tomorrow is to preserve the wisdom of the past and to build upon it based upon new insights rather than to continue to discard knowledge and theory in favor of the latest, most-fashionable concepts.

Traditional providers of education (schools and universities) will find a need to place a premium on preparing students to learn. The emphasis may shift from what students learn to how students learn. Professional certifications, evolving toward competency based models, will grow in volume and importance as organizations shift their expectations from knowledge and experience toward demonstrated competencies.

6. Aging population provides challenge and opportunity. Increasing life expectancies will challenge world resources and place increasing pressures on the cost of providing healthcare to a larger percentage of the world's population. Adding years to life comes at a premium of healthcare costs, and society has not addressed the ethical and moral ground of our "at all costs extend life" beliefs. Likewise, our models of social welfare for the aged are based on assumptions of the many (working) paying for the few (not working.) Declining world populations and expanding aged populations are already testing the durability of these models around the world. It seems working longer will be a certain option, if not requirement, to postpone a day of reckoning. Organizations will need talent, and people will need the economic means to shore up their finances. Retirement may quickly become a short-lived artifact of the latter half of the 20th century.

There will also be opportunity in the growing aged market. Never before has the world faced the numbers of aged citizens and little is known about the consumption and lifestyle needs of this segment.

Demographers predict that by 2025 the majority of the population will be 65-plus. With housing, furnishings, and the cost of raising and educating children behind them, we can anticipate whole new lifestyle options and experiences being created for a vital and growing segment of the population when other segments might well be in decline.

Quality of life may resurface with significant importance when the answer is not driven by the formula of "more" and the engine of growth—rising populations—is no more. Stable or declining world populations could have a dramatic impact on global economies.

7. 21st century quality may appear obvious in this section—like going to a dictionary to look up the future of quality and finding "see quality." However, this is fitting because quality is not what it was in the past. Organizations should prepare to benefit from what quality is becoming or they will be subject to the competition of those that do. The practice of quality has traveled a long evolutionary path, from quality through pride, to quality by inspection, to quality assurance, quality by prevention, perfect quality, and perhaps quality of creation. We have also seen quality depart from an aspect of product, or service, to the quality of management, and ultimately the quality of the enterprise itself. From products, to processes, to systems, to enterprises. Through all this evolution one truth has not changed. Quality is ultimately what the customer says it is, and for what the customer is willing to pay. This truth is shaping organizations, industries, and countries. It is an immutable truth, increasingly so in an information rich environment.

Dr. Joseph Juran (1904-2008) gave the quality community a compelling prophecy. He said the 21st century would be the century of quality. What was it that he foresaw? Did he foresee the expansion of quality into every sector of the economy—manufacturing, services, education, healthcare, government, and nonprofit? Did he foresee the expansion of quality globally? Did he see a large scale realization of the importance of quality by leaders of all organizations? Or did he see all of these possibilities at once?

If quality in the last century was defined by control and improvement, it is clear—that while necessary—control and improvement will not be sufficient for the 21st century. Change and transformation are the emerging tools of quality. There is debate over whether the same professionals can span a skill continuum from control to transformation, but leading thinkers in the field are investing their time in minting new tools for change and transformation and investing their energy to obtain new skills.

Many predict that near perfect product/service quality will be a minimum for being competitive in the future. Table stakes. The best companies are moving beyond product quality to manage their total customer experiences. Best practice companies around the world are showing, by their examples, the efficacy of quality applied to the improvement of the whole organization. (These are the national quality award organizations in nearly 100 countries—manufacturers,

service companies, small businesses, universities, schools, healthcare providers, nonprofits, and governments.)

What is clear is that quality still provides a sustainable competitive advantage, wherever it's applied. It is also clear that modern quality practices are still less common than you might hope. There is a huge opportunity for quality to be a force of change in the future of quality. And whatever quality is today, it would surely evolve in response to the constellation of forces it joins in shaping the future.

There's one additional evolution of quality that is evident and powerful. If quality started in the hands of skilled trades and artisans, it moved into factories when mass production became the norm. Then it moved out of factories into every imaginable kind of organization—small and large. Today quality is being called out of the organization into the space between organizations through global supply chains and through networks of companies that understand their greatest challenges lay outside their organizational walls. And from there, quality moves even further up the feeding chain to be used as concepts, techniques, and tools in the solution of social problems. While the number of examples is small, they are nonetheless evidence that quality is exerting itself in new ways—in hopeful ways.

8. Innovation has become a buzzword. It seems to mean the pursuit of something different and exciting. How innovation differs from R&D is uncertain. How innovation differs from improvement is unclear. What is clear is that innovation is increasingly the lifeblood of an organization. With today's accelerating pace of change no organization can assume its future without the ability to bring innovation to customers. How to stimulate an organization to innovate is the subject of papers, conferences, articles, and the elixir of consultants. An entire industry has developed and grown in response to the opportunity to help other organizations innovate. How to create cultures that innovate is a challenge for today's leaders. Countries strive to enhance their capacity to innovate. National policy, tax treatments, innovation zones, and direct investment all aimed at supporting and encouraging innovation are in place around the world. And a great deal has been written about educational systems and their ability to develop within people the mindset and skills to innovate. Companies include innovation in their strategies, annual reports, marketing literature, and in their assessments of their leaders. It is as if innovation was a discovery of the later years of the last century, and perhaps it was. Innovation it seems is poised to replace manufacturing as the source of wealth creation in countries.

If innovation means the ability of a company to anticipate customer needs, expressed or unexpressed, known or unknown, and bring products/services to the marketplace that excite customers, then clearly innovation is the fuel of growth in today's changing world, and more so tomorrow.

Scenarios of the Future as Viewed in 2011

Gregory H. Watson

Chairman and Academician, International Academy for Quality and ASQ Past Chair and Fellow

The scenarios chosen for the ASQ Future of Quality Study are designed to challenge our thinking by providing a broad spectrum of possibilities that reflect the perspective of the identified key forces for change. The scenarios represent a series of four potential circumstances that could evolve from our knowledge of the current state. These scenarios do not in any way represent a forecast of any future that will occur or even which might be desirable. Scenarios are used in futures studies as a means to think differently than we do in our routine, daily life. They encourage us to consider what would happen if our world migrated from the current state to this possible future state. What are the potential hallmarks of change along the various journeys represented by the scenarios? Learning helps to open our minds to new possibilities and opportunities that can shape the future in different ways (Schwartz, 1991).

The question that must be addressed is not whether these circumstances will occur but how their occurrence will affect the world and how mankind will respond to them. The key characteristics of the four scenarios include the following attributes:

- **Scenario 1: Global Awakening—The Utopian Scenario**

Population: Population stabilization in the range of 6 to 8 billion people

Environmental: Offsetting climate in conjunction with a long solar minimum

Political: Enlightenment and coordinated global action

- **Scenario 2: Resource Restoration—The Preferred Scenario**

Population: Population at the replacement rate of 8 to 10 billion people

Environmental: Offsetting climate in conjunction with a moderate solar minimum

Political: Collaboration among developed and developing nations

- **Scenario 3: Death by 1,000 Cuts—The Status Quo Scenario**

Population: Population growth to more than 10 billion people

Environmental: Offsetting climate in conjunction with a short solar minimum

Political: Minimal collaboration and rigidity in political positions delaying corrective action

- **Scenario 4: Past the Tipping Point—The Domsday Scenario**

Population: Population growth to 10 billion followed by rapid declines to less than six billion

Environmental: No solar salvation, generating a global collapse of the ecosystem

Political: Contentious political rivalries have blocked agreement on a path forward, so no decisions have been made; chaos and anarchy prevail



The scenarios are excerpts from “Prognostications: Scenarios of the Future as Viewed in 2011” published by the International Academy for Quality.

The full report is available at asq.org/2011/09/global-quality/prognostications-scenarios-of-the-future-as-viewed-in-2011.pdf.



Scenario 1: Global Awakening

The people and nations of the world have awakened and now understand and anticipate the complex, multi-dimensional, systemic nature of the growing global crisis. They have taken positive, enlightened technical and political action, coordinated through the United Nations, to assure equitable management of a sustainable world.

Long-term technical solutions include the following:

- *Resolution of issues related to nuclear power.* Generation of clean, more efficient nuclear energy through fourth generation, fast-neutron reactors; storage, recycling, and disposal of nuclear waste; and increased electrical-system power efficiency; and improved transmission-loss management through universal smart-grid technology.
- *Biotechnology.* Ability to understand and safely manage genetic modifications to improve crop yield and resistance to drought and pests.
- *Nanotechnology.* Delivering medical solutions to target specific diseases and promote cardio-respiratory health.

Solution of these ecological and energy-management issues became possible during a 40-year period of solar pacification. A solar minimum offset the exponential heating effect that was created by the anthropogenic climate change. The solar minimum allowed mankind a reprieve from climate deterioration. This wake-up call caused the people of the world to join forces and take seriously the cumulative impact of local pollution on the global environment.

The precedent of having the UN coordinate and balance actions had been instrumental in reversing the ozone depletion crisis of the late 20th century. Now this approach has been adopted to define requirements for economic development, helping to assure improved quality of life while managing the global environment in a way that maintains the human race at a sustainable global population of 8 billion people. The appropriate use of technology has been employed to eliminate the risk of potentially destructive environmental failure modes. Statistical analyses have determined the actions that are most likely to reverse the effects of environmental pollution on the ecological systems of the world. Global resource balancing has led to the “have” nations underwriting the “have-not” nations, preventing actions that would undermine the ecological balance. Quality methods and techniques have been built into local economies, generating win-win management of the global economic marketplace. The UN Global Economic Council focuses on the well-being of the world community rather than on individual nations seeking their own advantages. Technology is leveraged to solve the problems that most affect mankind as a whole, rather than merely for economic return—especially for medicines and living infrastructure systems.

Table 1 indicates how the key forces identified during the ASQ 2011 Future of Quality study influence this scenario.

.....
TABLE 1

Influences of Key Forces on Scenario 1: Global Awakening

Key Force	Nature of Its Influence on This Scenario
Global Responsibility	<ul style="list-style-type: none"> • Nations align by regional divisions of nature (e.g., by dominant watershed rather than by geo-political or cultural boundaries). • Focus on collaboration assures all people enjoy an equal opportunity to access the Earth’s bounty. • New economic currency measured in terms of clean water, pure air, adequate foodstuffs, and sufficient energy, rather than monetary values that do not reflect basic human needs.
Consumer Awareness	<ul style="list-style-type: none"> • Recognition that rampant consumption of resources is detrimental to a sustainable world. • Wasteful transformation of resources into useful products is not tolerated. • Definition of quality in terms of luxury replaced with pragmatic utility in both the production and life cycle application, assuring minimal total cost to society. • Consumer decisions driven by a new wave of austerity. • Consumerism no longer is a motivation for economic growth.

Globalization	<ul style="list-style-type: none"> • New global playing field generated by shift from monetary policy (exchange of money) to social policy (exchange of value). • Associated new indicators integrated with fundamental human rights—the right to exist, socialize, and obtain personal development—across all nations and organizations. • Emphasis moves to the similarities among nations and races, instead of the distinctions. • Collaboration and focus on mutual benefits enhanced by increased capability to communicate across cultures. • Greater rapport exists in the face of diversity rather than animosity and divisions that alienate people.
Increasing Rate of Change	<ul style="list-style-type: none"> • New perspective on change—it can be harnessed and is not always required. • Excessively rapid or frequent change understood to be wasteful. • Competition as a driver of change replaced by cooperation. • Social democracy replaces the capitalist motivation for all mankind to join the ranks of the bourgeoisie. • Technology managed across all companies. • Technology transitions minimize waste and loss to society.
Workforce of the Future	<ul style="list-style-type: none"> • Work redefined as “any motion that produces value and benefits society” due to renovation of the world value system. • Work considered to be a developmental process rather than a series of completed actions. • Continuity in strategic direction and alignment of purpose increase in value because they eliminate waste and take advantage of past wisdom and lessons learned. • Future performance effectiveness and efficiency leverages these new circumstances.
Aging Population	<ul style="list-style-type: none"> • Aging population becomes a resource of wisdom for society. • Older citizens remain active to maintain exceptional healthcare and forgo the “social benefit” of retirement. • Elder generations bear the responsibility for the effects harvested in prior years and help to facilitate required social transformation to make the world a better place.
21st Century Quality	<ul style="list-style-type: none"> • Quality has become the pervasive value of the new society, reflecting both the objective of the social system (democratic quality of life) and a motivator for minimizing the waste of resource losses to society (known as the “Taguchi effect” in honor of the Japanese engineer whose concept of value-based management created an economic foundation for the new non-monetary value system that has been introduced as a quality of life initiative by the United Nations). • The philosophy, methods, and tools of quality have been incorporated into all engineering, business, and social science academic disciplines and are taught in the common core curriculum. • All professional societies/associations sponsor groups that focus on the adaptation of quality into their disciplines and bodies of knowledge. • Quality is truly ubiquitous, being an essential factor in all professions and organization types. • Quality provides the direction for rational decision making in an uncertain world, contributing to the discussions of all questions raised in society.
Innovation	<ul style="list-style-type: none"> • Inclusive innovation has evolved to become the hallmark of transition to future generations of mankind. • Growing social awareness has increased mankind’s appreciation of the benefits of human diversity for developing and applying potential new technologies that eliminate the squandering of resources and create lasting value. • The general concept of innovation has separated into macro-innovation (focusing on the global environment and the inter-system operability) and micro-innovation (focusing on new technologies, products, and services). • Macro-innovation minimizes total waste across all global resources. • Micro-innovation solutions require evaluation cycles to assure waste is avoided and developments generate global sustainability. • Innovation has moved from an art to a science that contributes to the policy decisions that govern global activities.

Scenario 2: Resource Restoration

Nature has granted mankind a reprieve in the form of solar pacification, which lowered the average earth temperature 7°C. Although global warming effects that have occurred over the past 40 years continue to build, they have been masked by the decrease in solar radiation caused by the reduction in sunspot activity. These cooler temperatures have rolled back some of the negative consequences of climate change by relieving the symptoms of anthropogenic global warming. They do not address the root causes, however, and merely are delaying the long-term impact of global warming.

The following factors have significant influence on the quality of life for all people:

- The mini-Ice Age has benefitted mankind by stimulating world leaders to face the reality of our fragile environment. A more conscientious approach for attaining a systemic solution of the driving causes has been adopted.
- The growing population has been recognized as a key factor in climate change, so global leaders have agreed to use a combination of tax policy and contraception to limit increases to 8 to 10 billion inhabitants.

- Additional work is under way to improve infrastructure and support this population with pure water and adequate food.
- The need to provide meaningful and honorable work while sustaining the global ecosystem now is emphasized in decision making.
- Universal education is encouraged, building global literacy and increasing participation in local and national politics.
- Organizations have begun to realize their dependence on a steady supply of affordable energy, clean air, and pure water.
- Technological developments can extend the projected life of known resource reserves by creating more efficient applications. For instance, the nuclear power industry has increased its previous 60-year estimate for uranium reserves to more than 3,000 years, based solely on technological advancements.
- The world is coordinating and dedicating its shared resources so that the deficiencies from past generations are being corrected and the survival of mankind on the planet is assured.

The influences of the futures study's key forces appear in Table 2.

.....
TABLE 2

Influences of Key Forces on Scenario 2: Resource Restoration

Key Force	Nature of Its Influence on This Scenario
Global Responsibility	<ul style="list-style-type: none"> • Regionally based geopolitical alignment exists in all areas of the world. • United Nations coordinates actions of leading developed nations that oversee less-developed nations, following the European Union and Organization of American States examples. • A "global democracy" may be the ultimate objective for mankind, but lessons learned in the "Arab springtime of democracy" will affect its nature. • Regions are more likely to be influenced by policies that affect their immediate neighbors than those intended to affect the entire world.
Consumer Awareness	<ul style="list-style-type: none"> • Consumers have become aware that their buying criteria must include not only performance and quality but also the environmental impact of their purchases. • Consumers flock to the Internet to determine the environmental impact of their personal purchases of "durable goods." • Internet information shapes their personal buying trends. • Business-to-business procurement follows the consumers, leading to a "go green" campaign that increases sensitivity to the environmental impact of the entire supply chain.

Globalization	<ul style="list-style-type: none"> • Mankind has come to grips with the global ecosystem and the interconnectedness of national, regional, and global infrastructure. • Commitments have been made to work together across boundaries to address and resolve regional and global problems. • A regionalized division of the UN has created spheres of influence for all major geo-political areas, eliminating typical political posturing for leadership and “equal rights” with respect to decision making. • Brazil has taken the role of influence-shaper for South America, China for Eastern Asia, India for the Middle-East, Russia for Central Asia, and the EU and America continue their traditional roles. • The African Union has increased its political strength and established a close mutually-beneficial relationship with the League of Arab States. • Nations pool their resources and outsource governmental activities that can be consolidated. • “Cloud computing” services have reduced the cost of local investment in information technology infrastructure and the human capital investments required to manage common governmental services.
Increasing Rate of Change	<ul style="list-style-type: none"> • Global leaders have grasped the need to manage some forms of change. • Control of new products no longer involves patent law for protecting intellectual property. • Instead, laws focus on controlling production of durable goods by granting licenses to use new technology but only when consumption of natural resources is required. • Cloud computing has led to standardized computer systems, more natural software migration paths, and less end-user anxiety as changes occur. • Human systems and processes are more stable and reliable, delivering expected outcomes. • Changes are tested and approved fully by users prior to implementation, rather than foisted upon mankind by producers. • Power in production management has shifted toward customers.
Workforce of the Future	<ul style="list-style-type: none"> • Literacy goes beyond basic education in reading, writing, and arithmetic and now includes systems, statistics, and quality as an advanced level for global citizens. • Workers can become either a “certified production worker” or “certified service provider,” by mastering and demonstrating entry-level proficiency in both theory and application of these core job competencies. • Developmental pathways for workers of the future are less functionally constrained. • Individual development plans foster personal growth from the apprentice level to the craftsman level in all recognized work disciplines and vocations. • Performance at each higher skill level leads to both economic benefits and esteem (recognition) for workers.
Aging Population	<ul style="list-style-type: none"> • Senior citizens have become elder statesmen and mentors, leveraging their knowledge and experience to resolve problems associated with the “me-first” trap of runaway consumption. • The elders are teaching mankind the benefits of austerity and stewardship of natural resources, which is based on the fundamental principles of all organized religions in the world and causing people to examine more carefully “what unites us” rather than myopically focusing on “what divides us.”
21st Century Quality	<ul style="list-style-type: none"> • Business excellence, Lean production, standards conformity, Six Sigma, and other quality-oriented communities have merged to create a more coherent approach. • Application of all the quality sciences and practices now is focused on a common goal for the benefit of mankind—improving the global quality of life. • Centers of quality competence (e.g., reliability, statistics, auditing, etc.) support communities of practice (e.g., healthcare, education, government, industry, service, etc.) and coordinate the use of best practices across organizational and regional boundaries.
Innovation	<ul style="list-style-type: none"> • Technology firms have set a new standard for cross-company cooperation through “collaborative engineering.” • Collaborative engineering consortia pool their technological prowess and intellectual property for the benefit of entire industries. • Governments recognize the value of this resource efficiency by providing significant tax incentives for completed projects that are approved by cross-industry consumer panels. • Development of environmentally-friendly technical solutions has become the imperative, forcing a wartime response requirement for focused technical breakthroughs. • Research and engineering now are required to innovate “on demand,” generating continuous and systematic improvement. • Innovations must resolve focused problems effectively, efficiently, and economically.

Scenario 3: Death by 1,000 Cuts

Petty bickering among liberal and conservative political parties in world governments led to significant delays in developing a collaborative global approach to the pressing, population-driven, anthropogenic changes in climate. Continual questioning of scientific methods and interpretation of data has led to arguments about the meaning of the symptoms, sources of chemical pollutants, and key interrelationships among various factors. Furthermore, the reality of solar pacification finally struck home after four years of rapidly decreasing temperatures coupled with negligible sunspot activity. Although this convinced politicians that action was required, the change process was inhibited by a breakdown in political will.

While time was invested to convince all constituents that they must be active in the change, the following developments occurred:

- At first, the global population continued to grow beyond the level of sustainment, reaching 10 billion inhabitants. At that point, the population stabilized to the rate of replacement.
- Global drought from climate change exacerbated the short food supply, and famine became widespread among both developed and developing countries.
- Food distribution systems were no longer able to support the dense population centers in megacities or the wide population spread in rural areas.

- Riots erupted into mob violence in megacities as criminal gangs took over distribution of the new drugs of choice—milk, bread, and eggs.
- Governments called for the military to manage food distribution across the 600 global megacities, and citizens migrated to the countryside in desperate search of food and water.
- Developing countries with agrarian economies increased their value as global partners while world-leading countries scrambled to protect their economies.
- Rigidly polarized political positions caused delays in making decisions and implementing technical solutions, so the world fell behind the power curve for corrective action.

It now appears that the ecological imbalance in nature may require a century or more for restoration. Although repairs finally have been initiated, humanity will suffer through the long recovery period. Widespread panic instigated many parallel actions to improve the situation, but systemic quality tools were not used to improve the environmental operation continuously. It was a case of too little, too late and without the proper focus.

How did the key forces affect this scenario? Table 3 provides a summary of their involvement.

.....
TABLE 3

Influences of Key Forces on Scenario 3: Death by 1,000 Cuts

Key Force	Nature of Its Influence on This Scenario
Global Responsibility	<ul style="list-style-type: none"> • Mankind has been globally irresponsible for many centuries and lackadaisical inertia is endemic. • Delayed action resulted in increased pollution and enhanced the negative effects of climate change. • Shock therapy was needed to reverse this historical trend and focus popular opinion on addressing issues that require unpopular choices. • The net effect is a renaissance of positive global socialism—“global goodness”—that cuts across religious, racial, and cultural barriers. • Developing security in livelihood for all of mankind is the new focus.
Consumer Awareness	<ul style="list-style-type: none"> • Consumers’ awareness has increased, but purchasing choice options have diminished; dependability of core functions at the best price point has become the emerging definition of “exciting quality” in products. • Market pricing does not tolerate the cost effects of poor design processes or waste in materials or operations. • Customers require assurance that products will last for the advertised lifetime. • Reliability, rather than overly aggressive marketing promises, drives this marketplace.

Globalization	<ul style="list-style-type: none"> • Globalization has begun to shrink in focus; regionally based collaboratives, based on negotiated positions among national members, are prevalent. • Nations were unable to build a “global cohort,” so they initially focused on increasing their standard of living through consumer-based development, but this self-centered approach collapsed as global supply chains disintegrated. • Businesses then transitioned to crisis-mode operations, which had a hugely negative effect on both national and global economies. • As enlightenment dawned, people began to realize that what adversely affects any of us adversely affects all of us. • Recognition that true democracy requires a global distribution of wealth that is sufficient to assure equitable quality of life for all people led to an understanding that global economics cannot be played as a zero-sum game with the world divided into “haves” and “have nots.” • A new basis for economics was born on a global scale—a capitalist Marxist blending that generated a holistic economic system for the good of all people.
Increasing Rate of Change	<ul style="list-style-type: none"> • Climatological systems reeled through major cycles of change; this caused random and radical reactions, rather than traditional linear or exponential responses. • These changes have driven all of the man-made processes and economic forces into reactive modes. • Global decisions were based on selective perceptions, which further randomized the world system’s responsiveness. • Constituencies jockeyed for better positions to obtain their fair share of the limited available resources. • The world was a mess and changed from minute to minute—change became synonymous with chaos. • World leaders finally recognized that they needed to modify many global behaviors to repair the Earth’s natural, economic, and social infrastructure. • Daily management systems and the application of control theory have replaced the focus on evolutionary and revolutionary change in conjunction with the global desire for stability and control.
Workforce of the Future	<ul style="list-style-type: none"> • Risk management and control methods have emerged as the critical leadership skills. • Proficiency in the use of data, measurement, monitoring, and analysis now is required for workers as they support daily management systems. • Process-management and statistical-thinking fundamentals are a core learning requirement. • Multidisciplinary teams working on cross-functional tasks are much less homogeneous, which requires greater interpersonal skills to reach consensus; the value of diversity is truly appreciated.
Aging Population	<ul style="list-style-type: none"> • The global famine and related epidemics affected both the aged and infant populations disparately because they were more vulnerable to health risks. • The world lost a generation of senior citizens and their collective wisdom during the times of strife and turnaround. • Environmental euthanasia offset the imbalance caused by the factor related to the aging population.
21st Century Quality	<ul style="list-style-type: none"> • Quality has been restricted to micro-economic applications rather than to benefit the world’s social system. • New product development is the principle application arena of the quality sciences and provides assurance of product reliability. • Emotive politics overcame the rational decision processes promoted through total quality management. • An independent mediator board of sages validated the science used to make the critical decisions for environmental resurrection. • Quality professionals were accepted as neutral and objective participants in the turnaround process, assuming essential roles as leaders and specialists.
Innovation	<ul style="list-style-type: none"> • Resistance to change has blocked new ideas, and managers now require significant, forecasted return-on-investment for every proposed product. • Innovation, which is synonymous with the development of useful capability, has been stymied under these conditions. • The longer payback periods associated with developing the infrastructure required to recover from past environmental degradation caused government and business leaders to support few innovative environmental technologies.

Scenario 4: Past the Tipping Point

The world's ecological systems suffered a cataclysmic collapse due to man-generated pollution. The ozone layer, previously saved from chlorine, is now under attack by methane. Unchecked increases in the density of carbon dioxide and nitrous oxide have accelerated the warming effects of the other greenhouse gases. The brief respite generated by a period of solar pacification that lasted less than a decade provided an excuse for naysayers to delay addressing the global warming problem. The subsequent events were disastrous, as described below:

- The thermal readjustment occurred so swiftly and was so significant that scientists were unable to thwart a global meltdown of the polar ice caps and all major mountain glaciers. This raised the ocean surface approximately one meter, adding even more pollutants to the ecosystem.

- The resulting acidification of the oceans caused the loss of major fisheries and coral reefs around the world.
- Coastal residents fled to temporary homes on higher ground.
- The population had grown to 10 billion inhabitants, but it rapidly fell to less than 6 billion. The lack of a speedy and effective human response created global chaos, including war, plagues, famine, and pandemics.

At this point the future appears grim. Mankind has taken a quick, giant step backward toward the Stone Age, and Earth's biodiversity has been reduced to a fraction of its pre-pollution era. The ability for the planet and society to recover remains uncertain. Sadly, the survivor instinct that now exists inhibits the close global cooperation necessary to resolve these issues effectively and efficiently.

The key forces described in Table 4 interacted to generate this "doomsday" scenario.

TABLE 4

Influences of Key Forces on Scenario 4: Past the Tipping Point

Key Force	Nature of Its Influence on This Scenario
Global Responsibility	<ul style="list-style-type: none"> • Mankind has acted irresponsibly, blindly consuming the Earth’s resources in a never-ending desire for more and better durable possessions. • Fractious behavior and selfishness have prevented timely action and adoption of austere ways to achieve an adequate quality of life for all people. • Nations became insular and assumed isolationist attitudes, generally rejecting the principles of social democracy; cross-national cooperation was negligible. • Global cooperation occurred only when the environmental situation became moribund. • Even then cooperation was laced with mistrust because developing nations remained skeptical regarding the motives of developed nations.
Consumer Awareness	<ul style="list-style-type: none"> • Consumers continued to enjoy greater, better, and faster product functionality, highly valuing luxury brands—until the global collapse occurred. • Immediate consumer backlash caused many unreliable luxury brands to lose value and to disappear. • The economy contracted greatly as consumption focused on essential existence of family units. • White-collar workers suffered disproportionately because they did not have anything perceived as valuable to trade in the barter-driven markets.
Globalization	<ul style="list-style-type: none"> • Social, economic, and political systems collapsed in conjunction with the failure of the ecological system. • Megacities were affected most because their infrastructures depended so strongly on external support systems. • Megacities, which had been hubs for global commerce and dialog, became dysfunctional war zones where people fight to survive. • Globalization and cooperation have ceased.
Increasing Rate of Change	<ul style="list-style-type: none"> • When the global collapse occurred, the increasing rate of change stagnated and then reversed into a constantly declining state of degradation. • The climate change has had a drastic impact on life, so humanity now is operating on a survival-of-the-fittest basis, scavenging for the means to exist for another day. • Energy systems, clean water, nutritional food, adequate shelter from increasingly harsh weather, and transportation for moving goods between communities are required to preserve society—as in a war-torn country.
Workforce of the Future	<ul style="list-style-type: none"> • Skills that were once highly valued are worthless in the new “survival-based” economy. • Mankind’s reversion makes skills such as foraging, hunting, fishing, and camping essential; only people who can adapt and live without previous conveniences are able to endure.
Aging Population	<ul style="list-style-type: none"> • Global warming diminished the survival rate of the elderly and the young.
21st Century Quality	<ul style="list-style-type: none"> • Maintaining quality of life and climbing Maslow’s hierarchy to sustain homeostasis at the existence level are the primary purviews for applying quality principles and practices. • Achieving subsistence products and transferring survival knowledge from generation to generation are the outcomes emphasized in quality initiatives.
Innovation	<ul style="list-style-type: none"> • Structural innovation has been set aside in favor of essential, local innovations that are both necessary and sufficient for assuring the basic qualities of life. • Innovation, as a factor in improving the condition of mankind and the planet, has become passé; the value system supporting that socially-focused approach has died.

Implications



Many of the comments this year are not exactly new. Threads of the comments have filtered through the successive reports. Much of the future described in 2008 is the future described in 2011. But it is a future that we are closer to now. The implications become all the more important. We are playing a game of degrees, built from the past.

The financial crisis has put some of the issues into play, perhaps more quickly than anticipated. Quality professionals are not isolated anymore but brought into the fray. This is a double-edged sword for some. While being integrated into the organization in a meaningful way does alleviate awareness issues, it doesn't necessarily give credence to the unique and important nature of quality. Will integrating quality throughout the organization diminish the power of the methodology and the professional? No, say many of the panelists who see this change as an opportunity as the quality professional is asked to become more involved in decision making, moving up the management chain and making sure their organizations are ready for business.

"Excellence will be the entry point," exclaims William Denney, CEO, Quality Texas Foundation. No longer will it be OK to strive for excellence, products and services must enter the market without error, meeting—and exceeding—customer needs. Navin Dedhia, quality management consultant, confirmed this statement by noting that design functions will be checked in the early stages of product development so that there would be no rework or scrap.

With products and service handled, quality is free to look beyond the 20th century boundaries and explore sustainability, servicing the community, and world betterment. What the experts made clear is that quality must be better positioned with new performance criteria. Quality also insinuates itself into regulation, knowledge transfer, and training.

To accomplish this, the panelists agree that quality features need to be re-thought. It is no longer acceptable to view quality in such a narrow way. Quality cannot get in the way of loftier goals. "TQM acts as a brake," is how John Elkington, founding partner and executive chairman, Volans, addresses this. To move into world betterment, innovation is a daily imperative. But unlike past years, there is less concern that quality competes with innovation.

Quality will become more transparent, not just in the workplace but in everyday life. Quality becomes more inclusive and pervasive. And the metrics must be simpler.

"In the future, quality will be a measure to understand which product is more comfortable to human, society, and earth. Quality of human life will be focused on."

—Hitoshi Kamikubo,
Associate Director, Union
of Japanese Scientists
and Engineers (JUSE)

What follows is a distillation of the expert's reactions. Some of the comments fall in line with past study statements. Other comments challenge the past with new insights. Still other comments offer caution, calling on quality professionals to look forward but never turn a back to history.

Through all of this Joseph De Feo, president, Juran Institute Inc., warns us not to "lose sight of the fundamentals."

Here is a list of the themes that emerged from the comments, divided in three sections:

Implications for Quality

"Quality is returning as a priority subject (on the) executive's agenda."

—Eduardo Guaragna, Director, PGQP, Brazil

- Across continents, countries, and cultures, quality is a common language. Quality must adapt to customer needs in a specific socio-geographical way. Eventually quality will evolve to enable servicing of communities and brands will adapt to local cultures.
- Quality should shape society. Ultimately, quality methodology will be used to build a better world.
- Quality needs to be more inclusive in its approach and more pervasive throughout systems and communities. There is an overall lack of understanding of the depth and breadth of quality.
- Quality, as a discipline, cannot afford to stand alone anymore. Quality must be seen as aligned with other performance criteria.
- Quality metrics are sturdy. Quality metrics are comprehensive. Quality metrics must become simpler to have any staying power outside the quality profession.
- As more people become aware of quality methodology and put it to practice on the job and at home, quality becomes more transparent in daily life.
- As quality evolves and transforms it is important not to lose sight of the fundamentals.
- Innovation does not compete with quality. In fact, they complement one another very well. Innovation tools need to be incorporated into the quality toolkit.

- Excellence is the market entry point. Design functions will be checked early in the process. Scrap and rework will be further reduced and non-value-added activities will be permanently eliminated.

Implications for Organizations

"Approach quality concepts beyond the quality of product, referring to the quality of organization with all its components and aspects."

—Cornelia Butnaru, General Manager, RO
Quality International Management Services,
Romania

- Any successful organization will begin with highly ethical leadership. There will be a shift from quality management to quality of/in management.
- Far beyond fulfilling a market need, the quality organization will be useful to society.
- Quality methodology will be deeply embedded throughout an organization—all positions and into every relevant process. Any organization not fully committed to an excellence framework will be at an extreme disadvantage.
- While quality methodology addresses systems quality, organizations must approach quality beyond the product and service.
- Organizations need to be nimble, quickly reacting to the changing business climate. Speed and flexibility are key to business survival.
- Quality organizations have focused on waste reduction for many years. That certainly won't change. However, creating and implementing sustainability programs will become increasingly important.
- Innovation will be more than talked about, it will be fostered and work with quality initiatives.
- Organizations will have a greater range of tools available to them to make quicker, more accurate decisions.
- The use of nanotechnology will be critical to a technology-based organization's success.

- As the world becomes smaller and businesses become more global, organizations will find the need to recruit globally to ensure they have a diverse set of skills in key areas. Recently retired individuals will likely become semi-retired while workers turning retirement age will elect to stay in the workforce.
- The dwindling department does not spell doom for the quality professional. On the contrary, this is good news. There will be more opportunities for the quality professional in management. The progression could look something like this:

Implications to the Quality Profession

“The scope of quality...will be to encourage novelty and innovativeness in consumer experience.”

—Sunil Sinha, India

- While the workforce continues to age, retire, or move to other professions, it is a good time for quality professionals to become coaches for organizations as well as mentors for young workers.
 - Think strategically. Lead holistically.
 - The profession has been changing over the past few years—sometimes based on the natural maturation of the profession, other times because of the economic climate. Change will continue.
 - Quality professionals will need to be willing to significantly change the way in which they think of their jobs and themselves.
 - Stand-alone quality departments could very well be things of the past. As quality infiltrates organizations, it would only logically follow that stand-alone departments would no longer be needed.
- Line/middle managers move into roles of responsibility that include monitoring quality practices/initiatives. Quality professionals move into higher levels of the organization with more decision power as oversight of quality learning and training.
 - To accomplish this, however, the quality professional will need to prepare for the scenario. Many of the experts mentioned that quality professionals must broaden their skill set—a skill set outside of the typical quality, statistical, and technical regime. Panelists noted that knowledge in the humanities (psychology and sociology), business management, and knowledge transfer, will be essential in the near future.

Further

Emergence



The Course of Change Over Time

Deborah Hopen

President, Deborah Hopen Associates Inc. and ASQ Past Chair

ASQ now has completed six Future of Quality Studies, and it now seems appropriate to take a look at the longer-term perspective these analyses provide. As might be expected, some of the key forces identified appear more regularly than others, but the specific nature of those forces has shifted since the first study in 1996. The table on page 32 presents a high-level summary of those key forces.

Globalization

When viewing the summarized key forces, it becomes instantaneously obvious that globalization is the one constant across all of the futures studies. That conclusion may be a bit misleading, however, because the effects of globalization have not been consistent over the past 15 years. In fact, globalization has interacted with quite a few of the other forces over time, generating a substantially different operational climate for modern organizations.

Globalization and Technology. It is impossible to ignore the effect the increasing pace of technological change has had on globalization. Whereas the Internet and ecommerce were newly emerging realities in 1996, they are an everyday business method in 2011. At the time of the first study, organizations had begun to discuss the threat of Y2K and were trying to predict what technological advances would occur in the new millennia. The computer was viewed as the primary technological platform, and almost everyone was learning to traverse the information highway. Not many people guessed, however, that cell phones would become the new computers of 2011, taking over many everyday business and personal applications. According to the Child Trends Data Bank, “In 2009, more than three out of four children (77 percent) ages three to 17 used the Internet at home, more than three times as many as in 1997 (22 percent). Ninety-three percent had access to a computer at home, up from 15 percent in 1984.” (www.childtrendsdatabank.org/?q=node/298) With the increased use of cell phones, email, social networking software, and other similar options, communications are almost instantaneous, and the ability of individuals or organizations to keep problems a secret is almost non-existent.

Furthermore, the “technology of technology” has improved, decreasing the cost of development significantly and making new tools more affordable. The list of technological changes since 1996 and a discussion of their effects is beyond the scope of this analysis, but one thing is clear—technology is making it possible for globalization to expand to the far reaches of the world and to do so more rapidly and at a lower cost.



Globalization is the one constant across all of the futures studies. That conclusion may be a bit misleading, however, because the effects of globalization have not been consistent.

Globalization and the Marketplace. As many organizations began to conduct business across the globe, they were faced with difficult choices regarding products and service design and delivery. In 1996, it was noted that the focus on customers was increasing. By 1999, the need for customization and differentiation of products and services and shifting demographics offered implications relating to future requirements for goods and services. In this most recent study, it has been noted that consumers are becoming increasingly aware of their options; are learning more quickly of positive and negative attributes of products, services, and the organizations that provide them; and are expecting more responsive offerings. Although it is well-understood that people from different cultures with different lifestyles will have different expectations, the rapid spread of the global marketplace has forced organizations to grapple with the need to customize offerings appropriately versus the cost of doing so—and that cost includes the effects of increasingly complex operations in a world that is aggressively pursuing simplified processes with less waste.

Globalization and the Workforce. As organizations expand their realms, it is inevitable that the way they conduct business will change. Technologically-based services can be provided from any location, so there has been a shift since 1996 to outsourcing that often occurs outside the sponsoring organization's homeland, as was mentioned in the 2005 key forces. On the other hand, it may be more effective and efficient to produce and/or deliver some products and services near the customer base, which may be addressed through partnering (predicted in the 1999 study), outsourcing, and/or local operations.

Beyond that, however, is the effect of rising immigration rates across the world which also has a profound influence on workforce trends. In 2006, the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat reported, "In 2005, the number of international migrants in the world reached almost 191 million, which was 3 percent of the world population. Between 1990 and 2005, the world gained 36 million international migrants."

On one hand, these dynamics place new demands on organizations, including how to keep far-flung employees up-to-date and trained. On the other hand, the rise in knowledge management systems and self-paced training are proving to offset some of these issues. Interactions among workers, customers, and stakeholders associated with language and cultural differences still remain a challenge for many organizations, however.

The aging population that has been mentioned in the two most recent studies also is having an impact on organization capabilities, and that trend can be expected to continue for quite a while into the future. The newest members of the workforce, the millennial generation, bring new ideas and approaches, but they lack the wisdom of experience which is being lost as the baby boomers retire. This drain not only decreases the opportunities for mentoring, but it also changes the ways leaders must manage the workplace.

Globalization and a New View of Individual and Organizational Responsibility. As early as the 1999 study, "Environmental Sustainability" was included as a key factor. In 2008, both "Environmental Concerns" and "Social Responsibility" made the list. The current study raised these issues to a higher level, called "Global Responsibility." There is a growing understanding of the relationship between individual and organizational decision making and the sustainability of this planet. The need to scrutinize every decision for its potential ramifications on consumers/customers, workers, communities, and the environment has become an organizational imperative, as stakeholders focus more closely not only on products and services but also the footprint organizations create and as a byproduct of their operations.

The Role and Practices of Quality

When ASQ launched its first Future of Quality Study in 1996, the intention was to provide members and other stakeholders with a view of key factors that might influence the profession and the application of associated principles and tools. At that time it was recognized that quality had begun to be introduced to new areas, including healthcare, government, and education. Furthermore, it had become obvious that the role of quality as a specialty function was shifting, and quality was becoming an organizational leadership and management strategy. The need for quality professionals to prepare to integrate their fundamental knowledge and skills with broader managerial assignments was clear. The future focus would be on creating value for the organization.

Over the next six years, this prediction increasingly became the reality as quality-related duties gradually were absorbed into management systems, and the responsibility for quality was incorporated into every job. An economic downturn had occurred at the beginning of the new century, and growing pressure existed to prove emphatically that quality was more than a "feel-good" concept and that it made an incontrovertible contribution to economic success and long-term viability.

By 2005, a new concept of value creation had emerged—the triple bottom line (societal, environmental, and financial results)—and quality practitioners were being required to think and behave differently. Whereas the historic focus had been on processes and their inputs and outputs, a greater understanding of the more complex effects of systems of interdependent processes on performance outcomes had evolved. The competencies for individual success changed substantially, requiring equal attention to both the strategic and tactical levels. Additionally, the traditional technical tools were no longer sufficient; a wide range of people skills were necessary to build knowledge, skills, and commitment within the workforce.

So, where will the quality profession go next? The panelists in the current study believe that it will escalate to the enterprise and inter-enterprise levels. Interactions among organizations will become increasingly important with the opportunity for disconnects to

generate widespread and rapid negative consequences because of globalization and technology. Once again, individual success will be determined largely by an individual's ability to learn to adapt and grow professionally—quickly and continually.

Preparing for Change

Complacency is not an option, and it hasn't been for many years. Key factors related to change and innovation have appeared in most of the ASQ Future of Quality Studies. ASQ, its members, and other stakeholders need to continue to be prepared to address any new challenges that emerge creatively—whether they relate to values, approaches, techniques, or other areas. Clinging to the past is certain to jeopardize personal and organizational success in a world that moves at today's pace.

Although it's true that no one can predict the future accurately, the studies ASQ conducts do provide invaluable insight into the key factors that are expected to have influential effects. Looking back over the six completed studies, it becomes clear that we can chart the course of change over time and use that analysis to take advanced action to prepare for the changes that will occur.

SUMMARY OF KEY FORCES IN ASQ FUTURE OF QUALITY STUDIES						
	1996	1999	2002	2005	2008	2011
1	Changing Values	Partnering	Quality Must Deliver Bottom-Line Results	Globalization	Globalization	Global Responsibility
2	Globalization	Learning Systems	Management Systems Increasingly Will Absorb the Quality Function	Innovation/Creativity/Change	Social Responsibility	Consumer Awareness
3	Information Revolution	Adaptability and Speed of Change	Quality Will Be Everyone's Job	Outsourcing	New Dimensions for Quality	Globalization
4	Velocity of Change	Environmental Sustainability	The Economic Case for a Broader Application of Quality Will Need to Be Proven	Consumer Sophistication	Aging Population	Increasing Rate of Change
5	Increased Customer Focus	Globalization	Global Demand for Products and Services Will Create a Global Workforce	Value Creation	Demand for Healthcare	Workforce of the Future
6	Leadership	Knowledge Focus	Declining Trust and Confidence in Business Leaders and Organizations	Changes in Quality	Environmental Concerns	Aging Population
7	Quality in New Areas	Customization and Differentiation	Rising Customer Expectations		21 st Century Technology	21 st Century Quality
8	Change in Quality Practices	Shifting Demographics				Innovation

Looking to the Future From the Rearview Mirror

Paul Borowski

ASQ CEO

with insights from the 2011 Future of Quality Study Panel

As we began the 2011 Future of Quality Study, it occurred to us that we've finished the first decade of the 21st century—the century that, Dr. Juran said, could be the century of quality. I thought it would be instructive to ask the futures panel to reflect on the past to gain insight about how quality has evolved. Since 1996 the futures study has given us a framework and context to anticipate change; hopefully many have looked ahead and acted proactively for the changes we anticipated.

Quality has changed. The panel reflected on the changes they experienced. The text below reflects a summary of the panel's reflections.

It comes as no surprise that the insights and opinions of the panel vary. Few on the panel describe a status quo where quality is limited to notions of product and the processes of production and where quality is confined to a department. This would represent a traditional view of product-oriented quality in the 1980s. A few panelists point to evolution of quality but at rates well below those that assure an expanding role for quality, and those who practice it, to play in the improved performance of an organization. These two perspectives represent 15 percent of the panelists.

The vast majority of the panel (85 percent) points to increasing attention to the importance of quality, along with evolution—change and expansion. However, the time frame for observing change was not limited to the first decade of the 21st century. The panel's insights are often cited as the product of a 25-40 year career. There are similarities to the observations that appear as patterns that I've attempted to highlight. You might consider three uses of these patterns:

1. **Gauge Your Progress**—Is your organization experiencing these changes? The answer will give you a sense of the progress being made, or the opportunity for progress, in your organization.
2. **Focus on Results**—Are the changes in quality delivering results in your organization? Reviewing these trends may afford you the opportunity to strengthen, abandon, or adopt initiatives to increase the contribution of quality in your organization to deliver improved results.
3. **Prepare for the Future**—As you consider change, or needed change in your organization, what new skills and abilities will be needed to assure success? Use the answers for your personal development plan and as inputs to use in developing your workforce.



The vast majority of the panel (85%) points to increasing attention to the importance of quality, along with evolution—change and expansion.

A Larger Role for Quality in Strategy

Quality, the panel observes, is increasingly seen for its strategic contribution. In organizations using quality at the strategic level there is a keen focus on the customer. It is anticipating customer needs, understanding customer needs, ensuring those needs are clearly translated into the attributes of the product/service, and then managing performance that leads to customer satisfaction, delight, and loyalty. The customer leads the executive agenda and quality gets a seat at the table. In fact, customer-centered quality performance may be the first topic of business reviews. The contributions of quality are understood as integral to the realization of strategy and the success of the whole enterprise with top-line contributions—increased sales and market share—and bottom-line contributions—efficiency. Metrics evolve as quality evolves and as quality becomes more strategic the measures of the contribution quality makes should evolve too. To the traditional product measures of defect rate, rework, scrap, and warranty costs add satisfaction, loyalty, experience, engagement (customer and workforce), speed to market, earned share of market, energy efficiency, innovation, relationship quality, trust, and social responsibility.

Enterprise Quality (or Enterprise Excellence)

Organizations are realizing that product/service quality is a minimum requirement in the 21st century and that product/service quality alone is not sufficient to assure an organization's competitive advantage. These organizations increasingly look to the quality of management applied to the entire organization as a source of sustainable competitive advantage. A senior executive of a large Indian company said that the quality of management is far more important to the sustainable success of the enterprise than product quality because product quality can be changed quickly. The DNA of the organization takes years to develop and when management programs exist, years to change. Most of the panel cited a national or regional performance excellence framework such as the Baldrige Performance Excellence Program, EFQM Excellence Model, or Global Performance Excellence Award as an essential aid for those leading sustainable improved organizational performance.

Expanding Complexity and Scope

There is an observable continuum of evolution in the application of quality. In early applications quality was a function of inspection and sampling after production. Then quality moved upstream to quality assurance—the methods of assuring the quality of production so there would be fewer defects. This was often based in understanding and optimization of processes. Then systems thinking arrived to satisfy the insight that there are limits to the benefit of process improvement until you understand the interactions between the processes as they form a larger system. Then came the realization that an enterprise was itself a system that could be managed for improvement over time. And today the leading edge of quality practice has come to the realization that there is a system larger than the enterprise which may also be managed for improvement. Supply

chain is an example of quality coming out of the organization and applied to something larger and more complex. But even beyond supply chain, organizations are beginning to talk about networks, communities, and ecosystems as the scope to be managed. And with each evolutionary step came more complexity, and with that complexity new approaches to managing quality. To paraphrase Adam Kahane—simple problems can be solved with simple tools. Complex problems require different concepts and techniques.

From Product/Service Centric Quality to Experience Centric Quality

Most mature organizations understand the near perfect product quality is a minimum requirement in today's competitive environment. Customers expect perfect products and defect-free services. The age of Internet and social media gives organizations little time to recover from their mistakes. Moreover, in today's world of thin margins, the costs of rework and warranty can often make the difference between profit and loss. As organizations find that product/service quality is a minimum requirement they look to something else to differentiate themselves in the market. The label is experience management—the notion of managing every aspect of the customer experience to deliver quality. We saw this first in the entertainment industry, but it is increasingly common in hospitality, education, healthcare, and business-to-business industries. The customer's experience is being designed, manufactured, and managed.

Quality Culture

The old adage was “if we (the quality profession) do things right, quality will become everyone's job” and it became true. Quality lies at the foundation of everything the organization does and is becoming ingrained in the way people think. If once quality centered on the tools and techniques, it is evolving toward a culture of excellence—a pervasive mindset. The tools, one panelist noted, are inert until someone uses them. It is the passion of people and their commitment to excellence that makes tools and techniques powerful. In environments of rapid change leaders rely on the culture—along with the requisite tools and techniques—to give the organization resilience and agility. A quality culture integrates quality in every aspect of management. Or as one panelist said, “quality is woven in to the culture.”

Waste Reduction

Perhaps the first 10 years of the 21st century, spurred by the worldwide financial crisis of 2008, were preoccupied with waste reduction and the associated contribution of reduced waste to the bottom line. Organizations used the tools of lean and Six Sigma to systematically root out waste. While the gains of these efforts move directly to the bottom line of organizations, there is a concern that leaders might conclude the only contribution of quality is the reduction of waste. While the reduction of waste is clearly a contribution that quality delivers and while waste in all its forms will become increasingly abhorrent to society faced with the reality of a globe of finite resources, the quality community bears responsibility to speak up and offer the full complement of benefits quality can bring to the enterprise and represent the voice of the customer.

Quality in Every Field of Endeavor

While certainly not a trend that started in the 21st century, quality, once the almost exclusive domain of manufacturing, has grown into every sector of the economy—service, healthcare, education, government, and nonprofits. The concepts, techniques, and tools have proved to have universal applicability. It takes wisdom to know what concept, technique, or tool to use in a given setting and given maturity level. There are risks associated with leaders selecting the wrong tool and concluding quality doesn't work. Mitigating this risk is a key role of the quality community and in a world driven by “what's new” it's sometimes hard to accomplish. It may well be that an old tool is the most appropriate tool to use. Remarkable results have been noted in the field of drug and alcohol treatment facilities using nothing more sophisticated than the Plan-Do-Check-Act cycle. The concept, technique, and tool must fit the need and the experience of those who will use them.

New Roles for the Quality Leader

If once the role of the quality leader was to be effective in detecting defects and preventing defects from getting to the customer, the traits of success were being hard-nosed and inflexible. Today the successful quality leader must have outstanding soft skills. Still the knowledge of statistics, defect prevention, process controls, and industrial experiments are needed but also required are the skills of language of finance. Today's quality leader advocates for the customer and communicates throughout the supply chain and the organization. There are no boundaries where these skills are not welcomed and quality leadership is no longer limited to a quality department. Leadership can come from anyone in the organization with the right mindset and the right tools.

Another Point

While not a trend, there was another insight that may be obvious but should not be left to chance. That insight is that quality is not universally understood and applied. One panelist described the “haves”—those who get quality, use quality, and lead through quality. They enjoy positions in the market that we admire. There are the “needers” who are told they need quality and just want someone to go out and buy it for them. And there are the “clueless” who don't know what they don't know. The general sense of the panel is that the percentage of “haves” is increasing, but slowly and not equally around the globe. This is worth thinking about. The greatest risk may not be your internal rate of improvement but the comparative rate of improvement. Complacency may be more dangerous than ever. Whether true or not there were several comments that small and mediumsized organizations generally lag behind larger ones. If true, it represents an opportunity and a challenge. If quality has not been embraced by smaller organizations, why? How can the quality community adopt their concepts, techniques, and tools for the needs of leaders in small and medium-sized organizations? There's an opportunity there.

The Future of Organizational Quality

Harry S. Hertz

Director, Baldrige Performance Excellence Program

ASQ's futures study identifies eight forces of change. Here are my thoughts on how these factors will affect enterprise management and hence organizational quality. I'll begin by describing three overarching factors, then I'll address their potential impact, and finally I'll share my (wild) speculations about possible outcomes.

Overarching Factors

In my opinion, the three overarching factors are complexity, agility, and ethics/social responsibility.

Complexity. The complex nature of economic, business, and social systems will challenge organizations and their ability to survive and thrive. Leading an enterprise in this uncertain environment will also entail complexities. I envision a tension developing between global sourcing and competition on one side and local pride and protectionism on the other. Cost and variety will drive the need for globally-focused businesses and customers. Protectionism, social responsibility, and local well-being will drive local sourcing and a desire to buy locally. All businesses, but especially global companies, will face internal pressures to source for price and availability and, at the same time, to support local communities and reduce the waste and energy consumption associated with packaging and preserving products when shipping them long distances.

Agility. Organizations will need increasing agility to address the pressures of complex economic, environmental, and social systems. Strategy will be complex, reaction times short, and execution quick to take advantage of opportunities and resolve challenges. The ability to change strategy quickly and execute those changes will require even greater agility.

Ethics/social responsibility. I already touched on the likely demands of social systems in regard to complexity. Well beyond those considerations is the global expectation, and indeed need for organizations to act responsibly to protect the environment and to be good citizens in their local and global communities. I easily can foresee first the large-scale voluntary and then possibly mandatory reporting by organizations of a high-level social responsibility index—a formalized compilation of some current corporate responsibility indexes, merging carbon footprint, waste



Strategy will be complex, reaction times short, and execution quick to take advantage of opportunities and resolve challenges.



of all types, and societal service data. An index of this nature could affect business-to-business decisions (e.g., we only source from companies with an index greater than 95), consumer buying decisions, and maybe even tax credits and bases.

Effects of Overarching Factors

I believe that innovation, work systems, and organizational core competencies will be most affected by these overarching factors, as follows:

Innovation. The role of technological innovation comes to mind first, and certainly the pace will quicken and products of nanotechnology, biotechnology, and quantum technologies will lead to unimaginable advances. I would like to focus, however, on process and business model innovation. We will need to develop extremely flexible, adaptive processes to meet the previously described challenges and to address business and consumer needs and desires. Furthermore, imagine the business model innovations necessary to meet the demands of novel global and local, flexible, and co-located and distributed organizational workplaces and leadership teams. Every mix of processes and business models will be needed—possibly simultaneously.

Work systems. Changes in this area flow from the innovative processes and business models. Expect innovations in how and where work will be accomplished and how flexible work systems will need to be. Decisions related to “in-house” (whatever that may be) versus supply-chain and partner contributions will face constant challenges—especially when global versus local production factors are involved. Of course, all of these effects create fodder for leading the enterprise and managing the workforce of the future.

Organizational core competencies. Work systems go hand in hand with core competencies. How will the development of intellectual property (IP) at warp speed affect IP protection rights and the patent process? Will organizations stop trying to protect intellectual property, and how rapidly will core competencies need to change to succeed under those conditions. The speed of changing requirements could impact the basic mission of the organization. Organizations will be challenged to identify blind spots that lead to the need for new competencies, products, and services to ensure long-term sustainability. The days of an organization having a core competency that lasts for an entire workforce generation already are behind us. Now we must ask how the speed of change will influence our need to develop and protect core competencies for a competitive marketplace advantage and how changing organizational core competency needs will influence workforce needs and skills.

Speculation on Other Possible Outcomes

My thoughts on other possible outcomes start with the future for educational institutions—particularly higher education. With the need for rapid change, lifelong learning, and rapid curriculum evolution, the functions of a traditional residential university education will be tested. We already are seeing a dramatic growth in distance learning, which is likely to continue. Educational needs probably will be fulfilled at multiple “institutions.” The role of residential higher education degree-granting programs may focus more on social maturity than subject learning, which will be distributed and could require a major redefinition of structure and management of educational enterprises.

The second potential outcome is perhaps the most Orwellian. With mass miniaturization, we may see home manufacturing, where we each make personalized products and manufacturers sell us the plans and raw materials. If this does happen, we need to be prepared to answer the following questions:

- What would this mean for today’s manufacturers?
- How would those new home enterprises be managed?
- What would the workforce do?
- What would the organization’s core competencies be?

Maybe this sounds far-fetched, but I am reminded of a current real-life example—my dentist and the manufacture of crowns. In the past, this was the work of an artisan supplier working from molds and needing multiple “fittings.” Today, a small laser-guided device makes the crown in real time in the dentist’s office, and the crown then is inserted immediately during the same appointment.

Finally, and far less speculatively, I believe enterprise management and enterprise quality will include significant components of regional enterprise collaboration. With a focus on social responsibility and accountability and on community responsibility, leadership partnering will lead to regional enterprises that develop multi-organization supplier-customer relationships. Those relationships will not only be with traditional suppliers and partners but also with partnerships among business, education, and healthcare organizations. Together, they will build social-responsibility index values and sustainable, healthy communities. Large multinational enterprises will need approaches that work equally well in all the communities where they have facilities. This expanded collaboration will challenge competitive situations and core competencies, but the outcomes should be exciting!

I’ll end where I started—with complexity. The ideas in this article may not represent what eventually happens, but hopefully they will stimulate others to think about the enterprise of the future and help us imagine how to deal with very challenging situations and unbridled opportunities. I propose we all meet in about 10 years and have a good laugh about these insights and predictions!

Toward a Definition of Quality

Paul Borowski

ASQ CEO

with insights from the 2011 Future of Quality Study Panel

How is quality defined? While those who participated in the study have a deep appreciation and understanding of quality, it's possible that some readers of the study will ask, "What do you mean, quality?" Perhaps even those working in the field will be interested in an early 21st century examination of what quality means. However, as you will see, defining quality is a difficult task because it has several definitions depending on the occasion.

Over the past 25 years, and probably longer, there has been an ongoing rhetorical discussion on the need to define quality. Statistically 50 percent of the panelists say it is impossible to define quality, the other 50 percent say that without a definition it's unclear what we're talking about. We conduct this study without defining quality. We simply instruct the panel that quality is what you know it to be. I was taken to task by a noted academic researcher who declined my invitation to participate in the study because we do not define quality at the start of the study. Any definition, he said, would be better than none. Statistically I know what side of the discussion he would take.

I invited the panel to share their definitions and offer a few of them to show the range of definitions available and then end this section with the insights of Roberto Saco, a past ASQ chair, when he invited the quality community to entertain the question of defining quality in 2008.

There still is no official definition of quality that serves all purposes. The statistics remain unchanged. Fifty percent say there is no single definition of quality. Fifty percent say there needs to be one.

Quality as Philosophy

- The pursuit of perfect that never ends.
- Quality is conscience.
- Excellence.
- Quality is the fulfillment of needs.
- Quality is the degree of feeling happiness.
- Quality is the intangible that makes a better world tangible.
- Quality is a set of principles and a set of methodologies for achieving the joint benefits of greater productivity, lower costs, better utility, durability, and satisfaction with products and services simultaneously that helps to develop customer preferences for sustained and acceptable use.
- Maximizing the benefit and minimizing the harm to society associated with any product or service.



- Quality is a way of life. It is a culture that makes us work in all our activities with a customer focus and with a philosophy of efficiency and excellence in what we do and in what we produce.
- Quality is the state in which all value entitlements (in its broadest meaning) are fully realized for customers and other stakeholders focused for the present with future considerations.

Quality as a Personal Ethic

- All of us doing, always better, the right things.
- Do the right thing, the right way, the first time, for the right reason.
- Treating everyone like a guest in your home.
- Always going the extra mile to create a holistically-satisfying experience for every stakeholder we deal with.
- The pursuit of excellence and deep understanding of all we do.

Quality in the Eyes of the Customer

- Quality is what the customer says it is.
- Meeting or exceeding my customer's expectations.
- I know it when I experience it.
- My total experience of the provider.

Quality in the Eye of the Producer

- Quality is compliance to a specification.
- Conformance to requirements.
- Fit for use.
- Meeting customer requirements.
- The property of a product or service measured against the needs of the customer.
- A complete set of realized inherent characteristics of products, process, or system to meet (customer) requirements.
- The provision of value to the customer as defined by the customer.
- Conforming to the requirements of the customer.
- The contract between the user and the supplier, between the customer and the producer.
- The value of a company's product/service.

Quality for the Enterprise

- Quality is the true value of worth of an entity.
- Enterprise performance.
- Meeting the needs of customers (external and internal).
- It is the conscience of a company and its fundamental responsibility for its consumers.
- Quality is related to the organization's capacity to satisfy stakeholder expectations.
- Quality is the degree to which the organization meets the needs and expectations of all its stakeholders.
- Meeting the requirements of the customer, the company, and related parts.
- A long-term profitable relationship with co-workers and customers.

Here is a general use definition several panelists mentioned. This statement was printed on a 1980s-era ASQ poster:

“Quality is the systematic pursuit of excellence.”

To conclude this article, a generous excerpt from the Roberto Saco-penned editorial, “Quality and the Three Conversations” is provided as food for thought. This piece was published in *Quality Progress* (July 2008) while Saco was ASQ chair (2008-09) and eloquently states the difficulty of identifying one definition of quality.

Roberto Saco

ASQ Past Chair

Rather than provide an operational definition of quality, I'd like to meander on a more elliptical route. And to this end, I'll take up here one of the threads of my inaugural speech in Houston on May 6. I've said that "quality is more than a profession. We join ASQ as engineers, statisticians, designers, technicians of all varieties and stripes, lab analysts, organizational specialists, psychologists, nurses, teachers, doctors, scientists, consultants, accountants, students, marketers, administrators, public employees ... Yet quality, I propose, is a calling—a calling that transcends whatever happened to be your professional entry point. We are honor bound to improve things. It's in our nature. And when someone asks what we do, I believe we should justifiably say that we're making the world a better place to live in."

I take much of my inspiration here from the recently departed Joe Juran. And the greatest tribute you can bestow on thinkers and leaders is to continue using their ideas after they've departed. Juran gave us many gifts: he promoted the human side of quality; he stressed planning and prevention as a complement to control; he wasn't afraid to think big; he asked us to focus on the vital few.

In this editorial, however, I want to highlight the distinction he made between "little q" and "big Q." As you know, little q has to do with the problems of production and the tactical tools that lead to control and improvement. Big Q was Juran's way of describing quality in a management setting: more strategic, more comprehensive and system-wide—in other words, quality management. It was in Juran's genius to recognize that these are two different conversations. That they apply different languages, in different domains: the shop floor and the board room. And the two conversations, little q and big Q, are indeed complementary. You need both to make quality real, to make quality stick.

Following Juran, I posit that nowadays we, in turn, have to make yet another distinction—what I'll call "really big Q." What is really big Q? Beyond quality control and quality management, we need a better, more coherent conversation around sustainability and responsibility, and we need to do so at a higher level than just the organization or the firm. This is quality at the level of entire social systems, where issues like global warming, business ethics, sustainable economies, ecology, and reciprocity are addressed. These are the issues of today.

Our growing awareness of the interconnectedness and interdependence of things on planet Earth lead us in the direction of systems thinking, complexity, and global reach. And I cling to the belief that if we are not actively addressing these issues and concerns, we won't be relevant for long.

We need then to make room for a third conversation. And just like little q and big Q, really big Q doesn't negate other conversations about quality. We can still talk about probability density functions and Ishikawa diagrams in the first conversation of little q. We can also have a discussion on quality planning and *hoshin kanri* in the second conversation of big Q. We need to have these conversations. They're useful and necessary. Yet, the three conversations can co-exist and even feed off each other to enrich our understanding and cement the value we can provide others. Think of it as a progression from the quality of products and services to the quality of management, and now to the quality of life itself.

Why should there be an emphasis on meaning and cause? Why this broader sense of responsibility? Why should we pay attention to this third discourse, this third conversation?

I recently attended a panel on global need hosted by the University of Oxford. Attendees included representatives from the Rockefeller Foundation. Here are some facts: There are 6.8 billion people in the world. Half of them live on less than \$2 a day. One of every 10 lives with a disability. School life expectancy is an indicator that's highly correlated with country wealth and standard of living; for most of Africa it's six to seven years. This is not on another planet, light years away. It's on our planet, our home.

The third conversation centers on meaning and our place in the world and a need to address not the issues of tomorrow, but the very pressing concerns of today.

I have refrained from using tables, diagrams, and relationship charts—all the marks of a visual thinker—because I do not wish to over impose my imagination on the topic. Instead, if this resonates with you, then it's up to you to make sense of the three conversations and how they relate to quality. The only claim I can make here is to create a context and forum within which these connections can happen.

And, what's more, let it be said that I never promised *QP's* editor just *one* definition of quality.



Postscript

David Luther

Principal, Luther Quality Associates and ASQ Past Chair

Change happens. As this note is being written, Google has purchased Motorola Mobility, the Dow Jones Industrial Average has had four 400-point swings in one week, tablets are poised to outsell PCs, and Apple, in market capitalization, has replaced Exxon as the largest company in the world. Social media has enabled the Arab Spring, my online book buying probably contributed to Borders' bankruptcy, and local used car prices are higher because of an earthquake thousands of miles away. The worldwide credit crisis has destroyed wealth, public and private, of organizations and individuals virtually everywhere. More stable processes continue, like U.S. population growth, which is steady but declining.

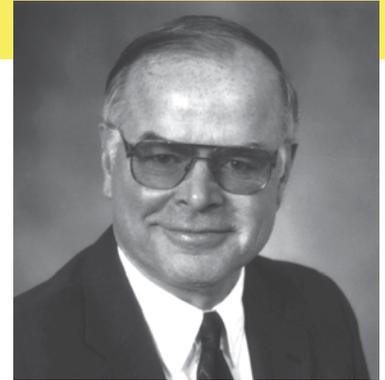
On a more personal basis, our children and grandchildren share with millions of others the difficulties of getting mortgages or even jobs that pay well.

Past futures studies have alluded to some of the above in general terms; however, the fact is we have no idea what is going to happen next week, much less five years from now. Certain large, powerful forces do continue such as the speed of technology change, the increasingly sophisticated use of data and information, the green revolution, and the growth of emerging nations. However, it is extremely difficult to convert general knowledge about any theme into a specific set of instructions advising us what to do differently Monday morning.

The future of quality studies are very useful in making us consider where we are today and what we can do to prepare for powerful change events, both predictable and unpredictable. As the 1996 study pointed out, if we cannot figure out what is going to happen next, we can certainly make sure we have the means to detect change when it starts to occur, and develop the robustness to respond quickly when we are being engaged or even overrun. Preparation works.

To this observer, the most important lessons from past studies are still very much in play. Understand your environment and have sensors deployed that will tell you quickly when change is starting to come your way. Second, look for opportunities. They will exist. See Google or Apple. Third, change, like politics, is local. It is the futures study you create for your organization, your profession, your career, or your family that deserves today's attention.

Bob Galvin, past chairman of Motorola, defined a leader as "someone who takes us elsewhere." That always seemed to make sense. Today, however, that role is shared with change. Our challenge, both collectively and individually, is managing the trip.



Understand your environment and have sensors deployed that will tell you quickly when change is starting to come your way.

Toward

Action

The 2011 ASQ Future of Quality Study is for your use. As described in Paul Borawski’s “Welcome to Emergence,” the study “is about provoking questions about what you want to do in anticipation of the future. Answering those questions makes you agile. Getting to a state of agility requires good thinking and, more importantly, good dialogue.” Now that you have read the futures study, it is time to think, discuss, and act.

On the next page is a brief list of questions to help you guide your future.

These questions—and their answers—will undoubtedly lead to more questions. Continue to engage in a dialogue with quality professionals and practitioners within your organization and communities.



How is my organization currently using quality methodology to prepare for the future? How can the 2011 Future of Quality Study assist in elevating the use of quality within my organization?



How can I turn the challenges identified in the study into opportunities? What resources are necessary to make these potential opportunities into reality?



Who do I need to team with to assist the further emergence of quality?



Emergence



600 N. Plankinton Ave.
Milwaukee, WI 53203-2914

The Global Voice of Quality™

FOR MORE INFORMATION, VISIT
asq.org/about-asq/how-we-do/futures-study.html.

Item B1192J

What does the future have in store for the quality profession? Every three years ASQ engages a cross-section of leaders from across the globe to consider what factors may affect us in the future.

The Changing Role of Quality

A Broader Perspective



The future is a mystery that unfolds day after day, quickly becoming the past. Every living being and every surrounding system is affected by the changes the future brings, and our response to that reality can range from wide-eyed wonder and anticipation to feelings of unease and fear of the unknown. There is almost no subject that captures our attention more.

Since the beginning of time, people have been trying to find a way to predict the future—usually in an attempt to harness and direct it. Today, most of us realize that soothsaying and other mystical approaches don't work—even though we still wish we had crystal balls that would tell us what lies ahead. Now we've turned to modern approaches to help us deal with this need—trend analyses, forecasting, simulations, and others designed to help us extrapolate the future based on past occurrences and projections.

The truth of the matter is clear, of course. No one and no process can help us predict the future with any accuracy. As comforting as such predictions might seem to be, they provide

little or no real benefit. The minute they are shared, we focus our attention on debating their merit and undermining their validity.

Think about last night's weather forecast. Loads of data, statistical analyses, advanced models, etc., were used to let you know whether you needed an umbrella, a snow shovel, or sunglasses this morning. Despite that effort, however, did you immediately chuckle and consider the prediction to be guesswork? After all, we all know the weather forecast is wrong as often as it is right. Does that stop us from eagerly tuning in to hear the prediction? No, but it sure doesn't cause many of us to rush to the closet and take out our topcoats in August, either. Instead, we talk about the weather forecasts, comment on their inaccuracies, and generally respond to them only when the direst effects are anticipated—and in some cases, we don't even take precautions then.

Under these circumstances, it might at first seem foolish for ASQ to conduct a study of the future every three years, and it would be if the purpose

of those studies was to predict the future. That's not what ASQ has set out to do since its initial study in 1996, though. Wisely, ASQ has adopted a process that has an entirely different intention—preparing us for a wide range of futures that may happen. Recognizing that security comes with the capability of handling whatever the future may present, the ASQ futures studies always identify key factors that are likely to have a significant influence on the future and develop a range of hypothetical scenarios that might occur.

The 2011 futures study applied this same approach and enlisted the input of over 140 leaders from 33 countries across the globe to generate the eight key forces that are expected to shape the future. The International Academy for Quality's chairman and ASQ past chair, Gregory H. Watson, wrote a comprehensive analysis, "Prognostications: Scenarios of the Futures as Viewed in 2011," which identifies three longer-term factors, merges their effects with those of the eight key forces, and describes the four scenarios that appear in the study report. A longitudinal analysis of all six futures studies (1996, 1999, 2002, 2005, 2008, and 2011) also is included. Several reflections on the findings help to bring the study's implications into focus.

What Might We Encounter?

The complete study is titled "Emergence." Study manager, ASQ chief executive officer, Paul Borawski, provides two definitions related to this title, as follows:

- *American Heritage Dictionary* (1976): "The unpredicted appearance of new characteristics or phenomena in the course of social evolution."
- Wikipedia (12:30 p.m. CDT, August 8, 2011): "In philosophy, systems theory, science, and art, emergence is the way complex systems and patterns arise out of a multiplicity of relatively simple interactions. Emergence is central to the theories of integrative levels and of complex systems."

Borawski is quick to point out the differences in the sources for these definitions and the implications they represent related to changes that have occurred over the past 35 years. Yes, the world as we know it has changed dramatically during that time, and the one thing on which we can

count is that more change—and probably even more significant change than we can imagine—lies ahead.

As the futures study reports, "Complacency is not an option, and it hasn't been for many years. Key factors related to change and innovation have appeared in most of the futures studies. ASQ, its members, and other stakeholders need to continue to be prepared to address any new challenges that emerge creatively—whether they relate to values, approaches, techniques, or other areas. Clinging to the past is certain to jeopardize personal and organizational success in a world that moves at today's pace."

As the study title indicates, the changes that we've been experiencing and will face in the future will lead us to new challenges and opportunities. If we view getting to the future as an evolutionary process, we can expect to develop new knowledge, skills, and approaches that will help us transform from today's caterpillars to tomorrow's butterflies.

Key Forces

The eight key forces in this year's study are described very briefly below, but a thorough discussion is provided for each of them in the "Emergence" report:

- *Global responsibility.* This force blends the growing consciousness related to being socially responsible with a deeper understanding of how seemingly small, local decisions impact the entire planet and its people—now and in the future.
- *Consumer awareness.* Sometimes expressed as "consumer power," this force represents the increasing ability consumers have to shape product/service design and providers' reputations. It is linked closely with consumers' abilities to access and act on information rapidly using the Internet, social networking, and other technological means.
- *Globalization.* This omnipresent force has appeared in every futures study, but its character has changed over time. First viewed as an opportunity for expanding markets, it became a threat as global competition and lower-cost labor sources took hold. Finding a balance between the ease of operating across the globe and the desire to support the local community

will be a critical consideration for decision makers in the future.

- *Increasing rate of change.* As previously mentioned, the pace of change has been escalating and that trend is not expected to stop soon. There's no place that this effect is more obvious than technology, where yesterday's dreams have become the products of the present. It's a bit frightening to realize that the products and services that will dominate the year 2025 probably have not been envisioned yet, but within minutes of their conceptualization, consumers will begin demanding them.



- *Workforce of the future.* With these first four factors dominating the horizon, the future workplace is bound to be affected. With the economic struggles that exist today, it's difficult to accept that there will be a lack of capable talent in the future. This will require organizations to adopt more flexible work practices and drive the need for workers to understand and apply new information continually. This also necessitates new models for learning.
- *Aging population.* Improved healthcare makes it possible for us to live longer, but it also drains natural resources and generates increasing costs of long-term care. The good news associated with this force is that the competencies held by this segment of the population can be used to

supplement and guide the diminishing talent pool described above.

- *21st century quality.* The application of quality concepts and techniques has changed significantly over the years, increasing in scope and results generated. Whereas in early times, the focus was on detecting and eliminating unsuitable products, quality moved upstream to managing processes and their inputs. Then it took on a more integrated perspective, improving systems and organizational outcomes. In the future, the span of application will increase, as quality becomes a key approach for solving global environmental, economic, and political problems.
- *Innovation.* It's almost inevitable that the final force is innovation. As the rate of change increases, consumers become more aware and demanding. New technology appears, and quality principles and tools are applied. Innovation becomes the solution—but not just innovation of new “things,” innovations of new systems for adapting the way we live to create a sustainable future.

Long-Term Dynamic Factors

As the “Prognostications” report states, “The long-term factors that serve as the basis for the scenarios relate to the fundamental needs of mankind for existence over the next 20-50 years. Adequate food supply, clean air, pure water, favorable climate, and energy supply will be affected as Earth’s population continues to expand. These factors are not static; they have a dynamic range of potential behaviors. Consequently, they must be studied using probability models that consider their most likely outcomes based on a range of inputs. Both observational data and the outcomes generated from simulation models using those observations are presented here as a foundation for the scenarios.”

Three primary long-term influences are discussed in depth in the “Prognostications” report. Their brief summaries below lay the groundwork for the scenarios that were developed, but only a review of their details and the way they integrate affect us can provide a sufficient understanding:

- *Shifting demographics in an expanding global population.* “As global population grows, we will

Table 1: Four Scenarios for Consideration

Scenario		Condition of Long-Term Dynamic Factors		
<i>Name</i>	<i>Type</i>	<i>Population</i>	<i>Environmental</i>	<i>Political</i>
Global Awakening	The Utopian Scenario	Stabilization in the range of six to eight billion people	Offsetting climate in conjunction with a long solar minimum	Enlightenment and coordinated global action
Resource Restoration	The Preferred Scenario	Population at the replacement rate of eight to 10 billion people	Offsetting climate in conjunction with a moderate solar minimum	Collaboration among developed and developing nations
Death by 1,000 Cuts	The Status Quo Scenario	Population growth to over 10 billion people	Offsetting climate in conjunction with a short solar minimum	Minimal collaboration and rigidity in political positions delaying corrective action
Past the Tipping Point	The Doomsday Scenario	Population growth to 10 billion followed by rapid declines to less than six billion	No solar salvation, generating a global collapse of the ecosystem	Contentious political rivalries have blocked agreement on a path forward, so no decisions have been made; chaos and anarchy prevail

experience an aging in the demographic profile of most developed countries, coupled with the emergence of a youth bubble in developing countries.” Three alternative future states, unrestricted population expansion, stabilization of the population growth trend, and stabilization of human population, are considered in the scenarios.

- *Environmental impact.* Two offsetting conditions—global warming and the atmospheric cooling associated with changes in the sun’s radiation pattern—affect the four scenario descriptions.
- *Political will to change.* “The ability to achieve a consensus direction will be confounded by the alternative political viewpoints. Changing the degree of collaboration in consensus decision making will be necessary to provide insight into mankind’s ability to chart a direction out of the mess that is foreseen. Potential political responses range from enlightenment to total dysfunctional decisions that place political pettiness ahead of scientific discovery.

Scenarios

None of the scenarios in the futures study report are likely to happen exactly as described; however, they “...are designed to challenge our thinking by providing a broad spectrum of possibilities that reflect the perspective of the identified key forces for change. The scenarios represent a series of four potential circumstances that could evolve from our knowledge of the current state. These scenarios do not in any way represent a forecast of any future that will occur or even which might be desirable.”

The top-line characteristics of the four scenarios are presented in Table 1, which identifies the associated conditions of the three long-term dynamic forces. The excerpted descriptions below provide a brief introduction to each scenario. A more detailed discussion of how these long-term factors influence each scenario, appears in the “Prognostications” report. The impact of the eight key forces is presented in “Emergence.”

- *The Utopian Scenario.* “The people and nations of the world have awakened and now understand

Looking More Deeply Into the Future



There is far more information included in the ASQ futures study official report, "Emergence" at <http://asq.org/asq.org/2011/09/global-quality/emergence-2011-future-of-quality-study.pdf>, and "Prognostications: Scenarios of the Future as Viewed in 2011" at <http://asq.org/2011/09/global-quality/prognostications-scenarios-of-the-future-as-viewed-in-2011.pdf>. These reports include the following components:

- A description of the process used to gather input from the 40 global leaders from 33 countries who participated in the study.
- Detailed descriptions of the eight key forces that were identified and their expected effects.
- In-depth analyses of the long-term dynamic factors that are likely to shape the future.
- Narratives portraying four possible scenarios that are logical outcomes of the interactions among the long-term factors and key forces.
- A longitudinal evaluation of the key forces that were established in the six futures studies conducted since 1996.
- Reflections on the implications of the current study on quality, organizations, the profession, the planet, and mankind.

and anticipate the complex, multi-dimensional, systemic nature of the growing global crisis. They have taken positive, enlightened technical and political action, coordinated through the United Nations, to assure equitable management of a sustainable world."

- *The Preferred Scenario.* "Nature has granted mankind a reprieve in the form of solar pacification, which lowered the average earth

temperature 7°C. Although global warming effects that have occurred over the past 40 years continue to build, they have been masked by the decrease in solar radiation caused by the reduction in sunspot activity. These cooler temperatures have rolled back some of the negative consequences of climate change by relieving the symptoms of anthropogenic global warming. They do not address the root causes, however, and merely are delaying the long-term impact of global warming."

- *The Status Quo Scenario.* "Petty bickering among liberal and conservative political parties in world governments led to significant delays in developing a collaborative global approach to the pressing, population-driven, anthropogenic changes in climate. Continual questioning of scientific methods and interpretation of data has led to arguments about the meaning of the symptoms, sources of chemical pollutants, and key interrelationships among various factors. Furthermore, the reality of solar pacification finally struck home after four years of rapidly decreasing temperatures coupled with negligible sunspot activity. Although this convinced politicians that action was required, the change process was inhibited by a breakdown in political will."
- *The Doomsday Scenario.* "The world's ecological systems suffered a cataclysmic collapse due to man-generated pollution. The ozone layer, previously saved from chlorine, is now under attack by methane. Unchecked increases in the density of carbon dioxide and nitrous oxide have accelerated the warming effects of the other greenhouse gases. The brief respite generated by a period of solar pacification that lasted less than a decade provided an excuse for naysayers to delay addressing the global warming problem. The subsequent events were disastrous..."

Where Do We Go From Here?

Regardless of what happens in the future, this year's study offers a clear call-to-action for those of us involved in furthering the principles and practices of quality. According to the report, "So where will the quality profession go next? The participants in the current study believe that it will escalate to the enterprise and inter-enterprise

levels. Interactions among organizations will become increasingly important with the opportunity for disconnects to generate widespread and rapid negative consequences because of globalization and technology. Once again, individual success will be determined largely by an individual's ability to learn to adapt and grow professionally—quickly and continually.”

Here are just a few of the implications and questions that emerge from this study.

- Quality is a language without borders. It could be used to set a new direction for the planet and mankind, making the world a better place in which to live and work. What do we need to do differently now to ensure that our expertise is applied to creating positive outcomes for the future?
- The integration of innovation methods with accepted quality tools provides a whole new definition for improvement. Yes, incremental improvement still will be used, but there isn't time for us to reverse some of the trends that are undermining sustainability with that approach. Breakthroughs are an essential component of the change plan. What can each of us do today to master these approaches? How can we learn to break away from the control mindset long enough to establish whole new levels of performance?
- Survival will require some sacrifices that will lead to greater rewards for all of us. Using facts and data to make decisions will help us identify the best choices for the long term, rather than sub-optimizing the future in favor of instant gratification. We'll learn to bring new data to the decision-making process—data that will help us rise above parochial interests. What can each of us do now to help others in our families, workplaces, communities, and leadership positions across the world learn how to make evidence-based decisions?

As ASQ past chair, David Luther, writes in this year's report, “The future studies are very useful in making us consider where we are today and what we can do to prepare for powerful change events,

both predictable and unpredictable. As the 1996 study pointed out, if we cannot figure out what is going to happen next, we can certainly make sure we have the means to detect change when it starts to occur, and develop the robustness to respond quickly when we are being engaged or even overrun. Preparation works.”



Yes, change will emerge, and it will lead us to new obstacles, as well as new solutions. The quality discipline is well-suited to help us identify when action is required, to analyze what options are available and what their results are likely to be, and to foster the collaboration and consensus needed to address seemingly insurmountable problems. We have the knowledge, skills, principles, and tools; now we need to embrace a leadership role that empowers others to embrace change with us.

More Online

Go to <http://asq.org/asq.org/2011/09/global-quality/emergence-2011-future-of-quality-study.pdf> to read the entire ASQ futures study, “Emergence.” The complete IAQ report, “Prognostications: Scenarios of the Futures as Viewed in 2011,” also is available at <http://asq.org/2011/09/global-quality/prognostications-scenarios-of-the-future-as-viewed-in-2011.pdf>.



Preparing for the Future

The Future of Organizational Quality

Harry S. Hertz

ASQ's futures study identifies eight forces of change. Here are my thoughts on how these factors will affect enterprise management and hence organizational quality. I'll begin by describing three overarching factors, then I'll address their potential impact, and finally I'll share my (wild) speculations about possible outcomes.

Overarching Factors

In my opinion, the three overarching factors are complexity, agility, and ethics/social responsibility.

- **Complexity.** The complex nature of economic, business, and social systems will challenge organizations and their ability to survive and thrive. Leading an enterprise in this uncertain environment will also entail complexities. I envision a tension developing between global sourcing and competition on one side and local pride and protectionism on the other. Cost and variety will drive the need for globally-focused businesses and customers. Protectionism, social responsibility, and local well-being will drive local sourcing and a desire to buy locally. All businesses, but especially global companies will face internal pressures to source for

(Continued on p. 12)

Teaching Managers About Quality's Future by Learning From the Recent Past

Robert E. Cole

Making predictions about the future of quality is risky at best. Rather than trying to project current trends, we can pursue an alternative strategy. This article examines a long-time leading quality organization—Toyota—that stumbled recently, and ask what can be learned from its experience. Toyota's name has been almost synonymous with quality. I have researched its problems extensively and reported the results in the *Sloan Management Review* ("What Really Happened to Toyota?" June 22, 2011).

Here are six lessons that should be valuable to the top management of any firm going forward:

- When adopting new strategic targets, firms must integrate them with existing commitments to quality. Toyota, in setting its sights on 15 percent of the global automotive market, failed in this regard. The most powerful way to ensure the maintenance of quality commitments is to monitor and adjust management incentives (including

(Continued on p. 13)

Quality— The Changing Forces and Future Forces

Joal Teitelbaum

Quality is the result of tangible and intangible dynamic components. There is no doubt this concept depends on people. Every three years ASQ explores these concepts deeply. In 2011, more than 140 specialists dedicated to quality participated in the Society's futures study, including significant representation from the International Academy for Quality (IAQ).

Three questions were raised based on the study's initial results:

- What are the implications to quality?
- What are the implications to organizations pursuing excellence?
- What are the implications to quality professionals?

I'll respond to these questions in the same way a living structure is created, moving from the cells to a complex system of organs and other functioning components. In other words, I'll begin by looking at the implications to quality professionals.

(Continued on p. 14)

The New Imperative for Leadership— Advancing From Quality to Innovation

Kostas N. Dervitsiotis

What are the challenges for leaders and managers who are striving to help their organizations survive these turbulent times and succeed in this age of great uncertainty?

During the century-long industrial age, management operated under conditions of relative stability. The future was expected to be similar to the past. Plans were prepared to guide business activities based on a forecast of demand. In this relatively stable environment, various methods were developed to plan, coordinate, and control activities to satisfy this expected demand. For management this was a period similar to classic or Newtonian physics in science. Total quality management (TQM), lean, and Six Sigma represent the best of company-wide approaches developed for such stable environmental conditions.

Recent advances in technology (e.g. computers, telecoms, and the Internet), free-trade regulations, and global geopolitical developments (the fall of the Berlin Wall and the rise of

(Continued on p. 15)



INTERNATIONAL
ACADEMY for
QUALITY

The Future of Organizational Quality

(Continued from p. 10)

price and availability and, at the same time, to support local communities and reduce the waste and energy consumption associated with packaging and preserving products when shipping them long distances.

- *Agility.* Organizations will need increasing agility to address the pressures of complex economic, environmental, and social systems. Strategy will be complex, reaction times short, and execution quick to take advantage of opportunities and resolve challenges. The ability to change strategy quickly and execute those changes will require even greater agility.
- *Ethics/social responsibility.* I already touched on the likely demands of social systems in regard to complexity. Well beyond those considerations is the global expectation, and indeed, need for organizations to act responsibly to protect the environment and to be good citizens in their local and global communities. I easily can foresee first the large-scale voluntary and then possibly mandatory reporting by organizations of a high-level social responsibility index—a formalized compilation of some current corporate responsibility indexes, merging carbon footprint, waste of all types, and societal service data. An index of this nature could affect business-to-business decisions (e.g., we only source from companies with an index greater than 95), consumer buying decisions, and maybe even tax credits and bases.

Effects of Overarching Factors

I believe that innovation, work systems, and organizational core competencies will be most affected by these overarching factors, as follows:

- *Innovation.* The role of technological innovation comes to mind first, and certainly the pace will quicken and products of nanotechnology, biotechnology, and quantum technologies will lead to unimaginable advances. I would like to focus, however, on process and business model innovation. We will need to develop extremely flexible, adaptive processes to meet the previously described challenges and to address business and consumer needs and desires. Furthermore, imagine the business model innovations necessary to meet the demands of

novel global and local, flexible, and co-located and distributed organizational workplaces and leadership teams. Every mix of processes and business models will be needed—possibly simultaneously.

- *Work systems.* Changes in this area flow from the innovative processes and business models. Expect innovations in how and where work will be accomplished and how flexible work systems will need to be. Decisions related to “in-house” (whatever that may be) versus supply-chain and partner contributions will face constant challenges—especially when global versus local production factors are involved. Of course, all of these effects create fodder for leading the enterprise and managing the workforce of the future.
- *Organizational core competencies.* Work systems go hand in hand with core competencies. How will the development of intellectual property (IP) at warp speed affect IP protection rights and the patent process? Will organizations stop trying to protect intellectual property, and how rapidly will core competencies need to change to succeed under those conditions? The speed of changing requirements could impact the basic mission of the organization. Organizations will be challenged to identify blind spots that lead to the need for new competencies, products, and services to ensure long-term sustainability. The days of an organization having a core competency that lasts for an entire workforce generation already are behind us. Now we must ask how the speed of change will influence our need to develop and protect core competencies for a competitive marketplace advantage and how changing organizational core competency needs will influence workforce needs and skills.

Speculation on Other Possible Outcomes

My thoughts on other possible outcomes start with the future for educational institutions—particularly higher education. With the need for rapid change, lifelong learning, and rapid curriculum evolution, the functions of a traditional residential university education will be tested. We already are seeing a dramatic growth in distance learning, which is likely to continue. Educational needs probably will be fulfilled at multiple “institutions.” The role of residential

higher education degree-granting programs may focus more on social maturity than subject learning, which will be distributed and could require a major redefinition of structure and management of educational enterprises.

The second potential outcome is perhaps the most Orwellian. With mass miniaturization, we may see home manufacturing, where we each make personalized products and manufacturers sell us the plans and raw materials. If this does happen, we need to be prepared to answer the following questions:

- What would this mean for today's manufacturers?
- How would those new home enterprises be managed?
- What would the workforce do?
- What would the organization's core competencies be?

Maybe this sounds far-fetched, but I am reminded of a current real-life example—my dentist and the manufacture of crowns. In the past, this was the work of an artisan supplier working from molds and needing multiple “fittings.” Today, a small laser-guided device makes the crown in real time in the dentist's office, and the crown then is inserted immediately during the same appointment.

Finally, and far less speculatively, I believe enterprise management and enterprise quality will include significant components of regional enterprise collaboration. With a focus on social responsibility and accountability and on community responsibility, leadership partnering will lead to regional enterprises that develop multi-organization supplier-customer relationships.

Those relationships will not only be with traditional suppliers and partners but also with partnerships among business, education, and healthcare organizations. Together, they will build social-responsibility index values and sustainable, healthy communities. Large, multinational enterprises will need approaches that work equally well in all the communities where they have facilities. This expanded collaboration will challenge competitive situations and core competencies, but the outcomes should be exciting!

I'll end where I started—with complexity. The ideas in this article may not represent what eventually happens, but hopefully they will stimulate others to think about the enterprise of the future and help us imagine how to deal with very challenging situations and unbridled opportunities. I propose we all meet in about 10 years and have a good laugh about these insights and predictions!



Harry S. Hertz

Harry Hertz is director of the Baldrige Performance Excellence Program for the National Institute of Standards and Technology (NIST). Prior to his work with the Baldrige program, Hertz worked as a research chemist and then in a series of management positions including director of the Chemical Science and Technology Laboratory at NIST. He has a keen interest in change management and the evolving definition of quality. For more information, contact him at harry.hertz@nist.gov.

Teaching Managers About Quality's Future by Learning From the Recent Past

(Continued from p. 10)

job transfer and promotion decisions) so that traditional commitments to quality retain their highest priority.

- Highly publicized quality failures lead consumers to reassess a firm's brand value through examining its responses to the crisis. Toyota's response to unintended acceleration was seen as slow, evasive, and defensive. In such cases, reputational

damage is likely to be long lasting. Firms suffering a quality crisis need to get the full story out as quickly as possible, be transparent, and act with humility. The Internet and the 24-hour news cycle exponentially expand the knowledge, speed, scale, and intensity of quality failures globally. The Toyota case also teaches that such advice is potentially superficial in the face of the complexity of specific quality failures. In Toyota's case, the company had to reassure the public that it was safe to drive its cars while the cause of the problems was still under investigation.

- Multinational executives in overseas markets need local and global information and a strong voice in recall decisions. Quality-related data and recall decisions were centralized in Toyota's Japanese headquarters with little outside input. This made Toyota less sensitive to local regulations and political imperatives as U.S. customer complaints were funneled directly to Japan. Key U.S.-based Toyota executives didn't even know the number of customer complaints on domestically sold models, much less have a voice in how to respond. For any firm responding to quality failures, getting the right balance between centralized control and local responsibility is critical to the success of crisis management.
- Original equipment manufacturers (OEMs) need to monitor their suppliers' design and manufacturing processes closely to assure quality. Toyota's sticky gas pedal problems came about through just such a failure. Suppliers cannot be allowed to choose new materials or designs without OEMs approving specs, testing procedures, and reviewing results.
- Recognize that user error can be reduced by improved design. It is all too easy for executives to dismiss a problem as user error as Steve Jobs did with the iPhone's® antenna problem. That's not a good idea! User error doesn't end a firm's quality or safety responsibility. Improved design can often reduce user errors. Notably, Toyota successfully redesigned the shape of its accelerator to deal with its stacked floor mat problem. Moreover, the U.S. legal system increasingly holds corporations responsible for user error. It behooves firms to work continuously to reduce user error.
- Toyota's stumbles are a powerful reminder that superior quality cannot be taken for granted. As new senior management teams move into

positions of power, they must recognize there are no guarantees that the systems and values that have served as the underpinnings for the organization's success in the past can be sustained without renewed commitment. Quality is not in any firm's DNA despite a Toyota executive's claim when he tried to justify dismantling a high level quality committee in 2008. Management systems are fragile. Continuity requires providing clear incentives, adhering to documented processes, flexibility, effectively socializing new employees, and creating a supportive organizational culture. In any organization, internal and external factors threaten to weaken its quality foundation—be they opportunities for growth, temptations to skimp on training, or pressures to lower costs. Corporate leaders must remain vigilant in maintaining practices and values that support high-quality outcomes, even as they adapt to emerging challenges.



Robert E. Cole

Robert E. Cole is emeritus professor at the Haas School of Business and Department of Sociology at the University of California, Berkeley. He is also a visiting researcher at ITEC, Doshisha University, Kyoto. Cole serves as executive director of the joint program between the Hamdan bin Mohammed e-University and the Management of Technology Program at the Haas School of Business. He is a long-term researcher on Japanese work organization with a particular focus on quality improvement, innovation, and organizational change. Cole is a member of the International Academy for Quality (IAQ). Contact Cole at cole@haas.berkeley.edu.

Quality—The Changing Forces and Future Forces

(Continued from p. 11)

Implications for Quality Professionals

The study offers eight key forces of change, which are described in more detail earlier in this issue: global responsibility, consumer awareness, globalization, increasing rate of change, workforce of the future, aging population, 21st

century quality, and innovation. These forces will be fundamental requirements for quality professionals in the future—no matter if their work involves the public or private sectors or applies to a broader and higher level of the organization.

The primary consideration here is that quality is shifting toward a “state of mind.” While at one time quality was associated with conscious actions and the application of specific tools and practices,

it is moving beyond that now. The unconscious mind will embed quality into its reasoning and that framework will affect every action we take.

Implications for Organizations

The essence of these forces is the need for organizations to focus on customers, regardless of the organization's mission. Governmental organizations need to learn the needs and expectations of both individuals and society as a whole. In the same way, private-sector organizations must pursue customer satisfaction continuously if they are to succeed. In the future, however, it will be necessary to grasp far more than customers' basic requirements for products and services; organizations will need to absorb a deeper understanding of the rationales behind customers' decisions.

Implications to Quality

In the global environment predicted in the futures study, quality will be based on structured information that ties knowledge directly to practical results. The way to transform the planet Earth requires applying continuous improvement to historical and emerging issues that lead to a better world.

We're already experiencing an additional dimension—speed—that affects the rate that new issues arise as well as the rate that breakthroughs in technology and other potential solutions become available. Although everyone doesn't recognize this new dimension yet, as the study points out, its influence on the future will be substantial.

Let me bring this into perspective. From the time Euclid, the Greek master of geometry who established the system of two axes, to Descartes, who added the notion of space as the third axis, almost 2,000 years passed. From Descartes to Einstein, who introduced the fourth dimension—time, only about 300 years elapsed.

As the ASQ futures study states, "Dr. Joseph Juran (1904-2008) gave the quality community a compelling prophecy. He said the 21st century would be the century of quality." It is my contention that if we introduce the "speed dimension" to global quality by applying the forces of change to shape the future, there is no doubt, we will see Juran's prophecy's turn into reality.



Joal Teitelbaum

Joal Teitelbaum is president of Teitelbaum Engineering Bureau, the only Brazilian construction firm that has been recognized as a winner of the National Award of the National Foundation of Quality. Teitelbaum is past president of PGQP, Regional Program of Quality and Productivity; a member of the Board of the Superior Council; on the board of trustees of the International Academy for Quality; and in leadership roles with many other professional organizations. He has been recognized on many occasions for his work in the public and private sectors, management, sustainability, and innovation. Contact him at joalt@terra.com.br.

The New Imperative for Leadership— Advancing From Quality to Innovation

(Continued from p. 11)

China) have ushered in a new digital era versus the industrial era, causing boundaries to blur among traditional industries such as transportation, publishing, and telecommunications. This period is similar to developments at the beginning of the 20th century with respect to quantum mechanics and the theory of relativity in modern physics.

As the interconnectivity among interacting organizations increased in recent years, greater interdependence among them followed, and this

led to more complexity (more players, more interactions) and much greater uncertainty. In such a continual process of destructive creation and renewal, the average life expectancy of corporations in the West decreased from 75 years in 1947 to 15 years in 2007. These ongoing trends pose new challenges for leadership in crafting an effective strategy, including deciding which products to offer or develop, the best technology to use, and the best markets in which to sell the products.

As a continual stream of new products and services reaches the market, offering greater value for consumers, many existing products and services become obsolete. The key result is that customer

expectations and preferences now change more rapidly than in the past. What used to be a great success, such as the Nokia™ cell phones, gives way to new bestsellers, such as the iPhone® or Samsung™ Galaxy II. This is an innovations-driven process for new products, processes, and new business models, rather than a quality-driven one for improving existing products and services. In a global economy of never-ending uncertainty, as customer expectations and preferences keep changing, the focus of searching for opportunities for new revenues and profits shifts from quality, which still remains very important, to innovation to meet emerging human needs and challenges from new unknown competitors.

Developing successful innovations involves both frequent incremental improvements, such as a faster chip or greater safety in a surgical procedure, and less frequent disruptive innovations, such as the cell phone or a new procedure for human organ transplants. This disruptive kind of innovation is strategic in nature and can have dramatic effects, sometimes creating new industries that change the business landscape, as in the case of online selling through Amazon.™

A business firm's capability to innovate successfully, such as Apple®, is now becoming the key to survival in the presence of persistent waves of change. This rests primarily on the quality of an organization's innovation process. This, in turn, depends on leadership's vision to excel now and in the future, on management's discipline to maintain flexibility, and on an organization's culture related to maintaining a climate of trust, willingness to experiment, creating a healthy attitude toward risk, developing tolerance for failure, and having the ability to learn rapidly and at a low cost from any failures.

There are three fundamental requirements for an effective innovation process. First is the ability to sense promptly and accurately any emerging value-creation opportunities by interpreting incoming weak signals from changes in the environment correctly. This can be done using human intuition or data mining. Once such signals become clear to an industry, then it is too late for a single company to exploit and gain the opportunity to develop a distinct competitive advantage. The timing for introducing Apple's iTunes® platform versus similar ones by competitors (Sony®, Samsung, and others), offers a significant lesson

about the importance of correct early detection and interpretation of the weak signals provided earlier by the Napster® experience of free music downloads. The second requirement is the ability to execute the innovation effectively, accounting for up to 99 percent of the total effort to bring a good innovation idea to market both rapidly and at a low cost. The third requirement is for leadership to always strive to maintain an overall balance in pursuing innovation, including a balance among the following:

- Incremental and disruptive (radical) innovation projects.
- Supply and demand of new ideas after the commercialization stage.
- Internal (e.g., R&D-initiated) and external (market-driven) projects.

Finally, the capability for success in sustainable innovation requires high quality in the organization design—the kind of organizational architecture that can attain optimal fitness in a continually evolving business landscape. This design requires management to re-evaluate the “core” and the “edge” components of the organization structure frequently. The core includes the key business functions that generate current revenues and profits (production, marketing, and others), which dominate business strategy development and execution. The edge refers to those parts of the organization at its boundary, which are continually exposed to change signals from the environment. These parts can sense directly the ongoing or oncoming changes likely to affect performance. The edge includes people in sales dealing directly with customers, those in maintenance or engineering receiving customer feedback on how products fail in usage, or those in the supply chain who can detect “disconnects” affecting the smooth flow of customer orders.

The pressure for organizational change and often the source of good ideas for implementing new innovations originate at the edge. At the boundary of an organization, people can sense more quickly the weak signals from the environment, compared with those at the well-established functions at the core, who mainly are preoccupied with making existing products better, cheaper, and faster.

This organizational design fitness enables a firm to blend well with an ever-changing business

landscape (customers, suppliers, competitors, and others) through modular components that permit effective loose coupling with other firms in a supply chain or its business ecology niche. Toyota's™ recent failure with the car accelerator problems had a huge cost on its finances and sterling reputation as a global leader in quality. This is a typical example of not having an effective organizational design, by having omitted regional managers' direct feedback worldwide (the edge) in its global information system. This proved to be a significant deficiency in providing prompt feedback on accident reports from car accelerator failures in the regions because such critical information was sent to the headquarters in Japan—to the core.

In today's global business landscape, the big challenge for leadership is to maintain a “bifocal view” on total performance—both for the short run to generate current revenue and also for developing needed incremental and radical innovations to generate revenues in the future. Apple computers, Google™, 3M, GE, BMW, Virgin Group, and others provide good examples of such leadership

capability as they introduce both small, incremental improvements while continually experimenting and developing successful new radical innovations that capture the imagination of consumers worldwide.



Kostas N. Dervitsiotis

Kostas Dervitsiotis is a member of the International Academy for Quality, the World Academy of Productivity Science, and other related professional societies. He has been recognized on numerous occasions for his conference presentations, teaching excellence, and research publications. Dervitsiotis has held several academic positions and has served as a director of the European Master's in Total Quality Management (TQM), chair of its European Academic Board, and member of its EFQM Advisory Council. His email address is knderv@gmail.com.

The Writing Was on the Wall, but We Thought it Was a Forgery

Rick Maurer

If you want to address the question, “What’s the future of quality in our organization?” you’ve got to know what’s written on the walls. There was a time when quality at Harley-Davidson dropped so low that loyal riders would joke, “If you want to ride a Harley, you’ll need two—one to ride and one for parts.” I heard an executive from Harley-Davidson describe that period by saying, “The writing was on the wall, but we thought it was a forgery.” Fortunately, Harley finally did understand the truth in the writing on the wall before it was too late. Today, Harley builds bikes that inspire fierce loyalty.

What about the future, though? Can there be writing on the wall for things that haven’t happened yet? Predicting the future is difficult, often impossible. Yogi Berra said it best, “Prediction is very hard, especially about the future.” Nevertheless, there are ways to look ahead that might increase the odds in your favor.

Of course it is important to look at trends in your business and in the world, but it is equally important to look inside your organization. In other words, you may be able to see writing starting to emerge on the internal walls. For instance, suppose you saw that Pacific Rim factories were gearing up to produce exactly what you offer but at far lower cost. What would you do if your organization lacked the capacity to respond?

There are two things to consider as you look at your organization: Where are we today? and Can we predict what might happen?

Where Are We Today?

The short assessment shown in Figure 1 can be used to check the pulse of your organization in the following four areas:

- *Commitment to values.* Does your organization maintain its commitment to core values despite distracting circumstances that may occur or does it only adhere to its values when it’s convenient? If your organization really is committed, the score will be high, indicating that changes
- in economic climate, tight budgets, etc., do not sway its commitment. Lower scores suggest that values may be treated like a “flavor of the month”—infatuations that get tossed when something more attractive comes along.
- *Approach to quality management.* Is quality integrated into everything your organization tackles? For instance, suppose you use Lean Six Sigma in your manufacturing area. Do you rely on this approach to solve every problem, determine how to leverage every opportunity, and make every decision? Or is your organization the victim of ad hoc methods that are applied sporadically? In this case, there may be occasional successes but there is no concerted effort to institutionalize that learning and expand quality improvement across the organization. Note that “ad hoc” is the lowest option offered on this scale because I’m assuming (or at least hoping) that readers of this publication come from organizations that at least support quality management to some degree.
- *Confidence in quality professionals.* If you and your colleagues are going to influence the organization’s direction and quality, you need a seat at the leadership table. This means that leaders must have confidence in your abilities and trust what you say. In fact, your organization’s leaders must be eager to hear your thoughts and recommendations. If confidence and/or trust are low, your involvement in the organization’s approach to addressing the future of quality will be minimal, and your attempt to make contributions will be a waste of time because no one in leadership will be listening.
- *Attention to the writing on the wall.* Are your leaders willing to let the writing on the wall influence them? Do they actively look for input, know what competitors are doing, sense the environment, and anticipate trends? Are they curious about things that aren’t monitored under the traditional system? Do they

Table 1: Organizational Assessment: Where Are We Today?

<i>Commitment to Values</i>				
5	4	3	2	1
Our organization maintains a steadfast commitment to its values despite the presence of distracting circumstances.				Our organization may ignore its values when distracting circumstances occur.

<i>Approach to Quality Management</i>				
5	4	3	2	1
Our organization relies on a well designed and executed quality management system to solve problems, leverage opportunities, make decisions, etc.				Our organization uses ad hoc approaches to solve problems, leverage opportunities, make decisions, etc.

<i>Confidence in Quality Professionals</i>				
5	4	3	2	1
Our leaders have confidence in the abilities of our quality professionals enough to trust their judgment and be influenced by their recommendations.				Our leaders doubt the abilities of our quality professionals so they are reluctant to trust their judgment or be influenced by their recommendations.

<i>Attention to the Writing on the Wall</i>				
5	4	3	2	1
Our leaders actively monitor the internal and external writing on the wall and are willing to respond to its information rapidly.				Our leaders ignore the internal and external writing on the wall and hold tightly to the course they have adopted regardless of the circumstances.

ask about what affects people’s work and how they perform? High scores indicate vigilant attention to the signals, and low scores point to a closed shop where leaders make it clear that they are on the right track, and no one had better tell them otherwise.

Interactions

Quality should be a core value, and I believe a commitment to it is critically important when looking to the future. If commitment to quality is low, compliance with quality management systems may be forgotten when other things seem more urgent or important. Product and service acceptability, customer satisfaction, customer service, and other vital requirements may be sacrificed. When quality and customer service values and the processes that support them are

embedded into the way your organization does business, they have a much stronger chance of surviving changing conditions.

Leaders with closed minds obviously threaten the organization’s ability to respond to signals and prepare for the future. When those leaders have confidence in the quality professionals and trust their input, there may be a way to open leaders’ minds. This, however, is difficult to achieve, and some leaders may devalue this input—even to the point of punishing the quality professionals by derailing their careers.

Can We Predict What Might Happen?

My suggestion for trying to anticipate the future is to speculate on what might happen after considering trends, past changes, and the writing on the wall. There are many approaches available

for crafting a view of the future, and as is the case with ASQ's futures study, most of them involve scenario planning.

The scenario planning process doesn't pretend to predict the future. This approach has too much respect for Yogi Berra to do that! Instead, the process encourages an organization to consider a variety of possible futures and to create a plan for each of them. As part of the scenario planning process, it's a good idea for organizations to build in ways to help people throughout the organization see the writing when it first starts to appear on the wall and to make it easy for people to communicate what they see.

In the early 1970s, the world was shocked when OPEC began to control the flow of oil. The supplies of petroleum dwindled, and the price escalated. It was not uncommon to see gas stations closed or people lined up for blocks trying to fill their tanks. The American public yearned for cars with greater fuel efficiency, but the big three automakers missed the writing on the wall. Most petroleum companies also missed the writing with the notable exception of Royal Dutch Shell, a company that barely made the list of top 100 providers at that time. It learned from the OPEC crisis and created a scenario that described how the company would respond if the supply of oil were limited. Leaders of Royal Dutch Shell still credit that scenario planning process as a significant reason for the company's success today.

It's very important to note, however, that scenario planning is unlikely to have lasting value if the four areas in the assessment are not addressed.

Without high scores in those areas, scenario planning may provide no more value than an interesting exercise.

Closing Thoughts

I believe that quality is an essential organizational value, that organizations need to embed quality management systems to ensure it is achieved, and that quality professionals have much to contribute to their organizations' efforts to prepare for the changes the future will bring. The ASQ futures study is a great example of a scenario planning process; the key forces it identifies and the scenarios it presents can be a useful foundation for your organization's planning efforts. If your organization is willing to accept the writing on the wall, remain committed to its values, adhere to its quality management systems, and rely on its quality professionals, it can develop its key factors, scenarios, and plans to prepare for whatever the future holds.



Rick Maurer

*Rick Maurer is an adviser to people who lead change in large organizations. He recently released the new paperback edition of his classic book *Beyond the Wall of Resistance: Why 70% of All Changes Still Fail—and What You Can Do About It*. You can access free tools on leading change from Maurer's website at www.rickmaurer.com.*

2015 FUTURE OF QUALITY REPORT

Quality Throughout



ASQ[®]

The Global Voice of Quality™



William Troy

Introduction

This year's version of the Future of Quality is a bit of a departure from past editions, in both the what and the how. I began by asking myself, "What is the best way to help the quality community prepare for the challenges of the future?" The answer, I decided, was to determine what the challenges were. If we could go to sectors and disciplines wherein quality is at work every day, and give our members, friends, and colleagues a glimpse of what lies ahead—what is really important—then we will have done a good service for the community. With regard to the "how" side, while we have always had excellent collaborations with experts from around the world, I decided to try something different. I wanted you to hear these experts in their own voices, talking about the things they have studied, known, and in many cases, loved. To get them to share their thoughts, we simply asked them, "Tell us about the future of the world you know best." The depth of their knowledge and the clarity of their insights will be readily apparent to you, and we are truly grateful to each of them.

Without a doubt, quality will play an integral role in all of these areas, so businesses should pre-emptively harness this insight to further optimize the use of quality in response to what lies ahead.

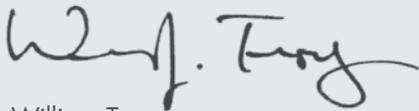
What you will see in the collection of essays is, I believe, unique in our Body of Knowledge. While such collections are not unheard of, we have reached out beyond the quality community to learn from experts who are new friends and who know a great deal about certain aspects of our future world. Our hope is that with a bit of the future thus illuminated, the quality community, in its broadest manifestation, from every discipline and profession, can then use these essays to discuss, debate, and learn. For businesses, the

value lies in converting the challenges identified into opportunities. Without a doubt, quality will play an integral role in all of these areas, so businesses should pre-emptively harness this insight to further optimize the use of quality in response to what lies ahead. After having read and considered what each expert has to say, we will be better prepared for the future that awaits us.

While I think you will be pleased by the breadth of the materials we have assembled, you will also find some common threads that are woven into many of the essays. Here are three that struck me in particular:

- There is an endless but essential requirement to knock down silos of information in order to get the right information to the right places. I saw in many essays the need for high-quality information to be broadly shared to allow timely decisions. There will be a high price attached to information that is “owned,” sequestered, or compartmented. Where speed of decision and speed of action is crucial, very careful decisions will have to be made about what to share and what to hold close.
- We must begin to truly think differently about things we assume we already know quite well. Take customers, for example—we think we understand them well already, but we don’t. I think several of our essays would suggest that we are at the dawn of a new era of customer understanding and even with a new understanding, we will barely be able to keep pace with changes in the nature of customer demand, and it is a field that is changing perhaps faster than any of us realize.
- The implications of almost limitless connectivity will change how we think about, and do, almost everything. We’ve all heard the saying “Everything affects everything else.” This is not really true today, but it will be tomorrow. From the connectivity that is an essential part of smart manufacturing, to medical schools holding classes for thousands of students simultaneously around the world, to city management, where a crisis in one sector can be immediately identified, communicated, and reacted to in seconds, everything will affect everything else, both for better and for worse.

One of the benefits of a collection of essays is that you aren’t expected to read all of them; pick the ones that speak to your interests. I hope you will find them enjoyable, useful, and worthy of your time. I wish to acknowledge the Long Term Strategy Group (LTSG) for their considerable skill and expertise in creating this collection. Finally, I want to express my thanks to all our contributors. The heart of this effort is their work, their thoughts, their words. We at ASQ are honored to be associated with them. Their generosity in sharing the insights they’ve developed over many years of study and practice is humbling.



William Troy
CEO, ASQ



Stanley McChrystal



Rodney Evans

A world of change requires flexible organizations and adaptable leaders. The nature of competition in the global marketplace of the future will only magnify these realities, and breaking down organizational and individual barriers to flexibility will be necessary to take advantage of opportunities for collaboration and growth. Stanley McChrystal and Rodney Evans, both from the McChrystal Group, present a case for a type of quality leadership that will drive success for teams in the future.

THE FUTURE OF LEADERSHIP:

From Efficiency to Adaptability

In the late 19th century a near-sighted Pennsylvanian stalked factory shop floors in search of the best way to perform each task. Experienced workers railed as his precise measurements of time, materials, and labor were leveraged to standardize each activity, threatening the jealously protected value of experienced craftsmen. Opinions varied, but overall the results were impossible to ignore. Capturing and continuously refining the optimal performance of each task, and then combining them with rigorous discipline into a well-honed and carefully defined process, allowed production to skyrocket while costs fell. And within a generation, Frederick Winslow Taylor became an iconic symbol

There is significant frustration with the reality that for many, what used to work now falters.

of modern efficiency—his writings and theories finding their way into society's myriad endeavors. Even modern organizations and leaders entirely unfamiliar with Taylor or his writings often reflect the pursuit of efficiency that underpinned much of the industrial juggernaut of the 19th and 20th centuries.

But in recent decades dizzying advances in information and other technologies have fundamentally changed the environment in which businesses compete, governments

A cluster of light bulbs on pencil stands, with one bulb glowing brightly. The background is a light gray gradient with a white diagonal shape on the left. The text 'Efficiency' is in a white script font, and 'Adaptability' is in a white sans-serif font, both overlaid on the image. An orange circle is positioned at the bottom right, containing a quote.

Efficiency Adaptability

Quality leadership for the future means that every individual in a system is empowered and inspired to own his or her "patch" of the place.

serve citizens, and women and men lead. There is significant frustration with the reality that for many, what used to work now falters. Against this backdrop, leaders routinely ask us how to increase in their team the initiative, innovation, and sense of ownership they associate with high-performing organizations. It's a great question to ask and reflects a significant departure from the more traditional quest for operational efficiency. But it would be better to ask how leaders can instill in their organizations levels of adaptability needed to deal with a new environment in which the only real constant is change. This represents the most important transformation in organizational leadership in generations, but what's driving it?

FROM PYRAMIDS TO NETWORKS

The reality is that we now live, work, and lead in an environment where static targets rarely exist. Activities, people, and information are linked, moving, connected, and enabled in ways that produce outcomes and effects that are fundamentally impossible to predict. More than ever, we deal in uncertainty. In the past, quality was about efficiency—getting the most x with the least y. But what if the variables aren't fixed? How can you solve for x if x is continuously changing? What if the problem you spent today solving won't be relevant tomorrow? Organizations must be able to identify and solve for emerging variables, and they must do it repeatedly.

In this environment defined by speed and complexity, top-down leadership is no longer sufficient. The inspiring, directive, strategic leader at the top of the organizational pyramid is no longer the most effective model by which to mobilize and optimize the talent within an organization. So the answer to the critical question is to create leaders at every level of an organization. Quality leadership for the future means that every individual in a system is empowered and inspired to own his or her "patch" of the place. But simply proclaiming that leadership is now the responsibility of everyone on the team doesn't make it so. It takes far more.

In 2004, despite an overwhelming superiority in superbly equipped military forces, the United States was losing the struggle against Al-Qaeda in Iraq (AQI). The loosely connected but organically adaptable terrorist network leveraged its inherent flexibility and speed to confound American forces constrained by its own hierarchical structures and processes. AQI's distributed network of operators was united by broad strategic guidance and an underlying common purpose—to do damage to the West. But the operators were otherwise free to operate autonomously using nontraditional methods. This allowed the terrorists to seize opportunity, fit structure to task, and, most critically, act faster than our more conventional structures and processes.

To succeed against this threat we had to become adaptable, both as organizations and as leaders. It required us to construct our own networks that were connected not only by communications but also by the sinew of trust and common purpose. Our cultural habit of compartmentalizing information and limiting our interaction with other military units or government agencies—to guard our prized autonomy—gave way to radical transparency and intentional interdependence. The effects were stunning as the synergies of a truly networked team of teams allowed us to reverse the tide against AQL.

When we left the service and formed the McChrystal Group in 2010, we saw similar challenges in our interactions with private clients. Our synthesis of lessons learned in the Middle East and in the private sector, called CrossLead, represents a new model of leadership and management. Firms in every sector of the economy need to radically change decision-making processes so that those nearest the issue, with the greatest understanding, are empowered to act. At the same time, we have to create communication forums so that decision makers lower in the organizations have the situational context and awareness of those at more senior levels.



The counterargument to empowerment is always, “I can’t give up these decisions, because my reports don’t have the big picture.” Rather than holding the decisions at a senior level, necessarily slowing them down and degrading their quality, what if the “big picture” is made available to a larger group? CrossLead requires transparent leadership, a major investment of time into communication, and constantly forcing cross-functional collaboration. The result is that leaders can make fewer decisions, create ownership and accountability below their level, and have more whitespace for understanding the environment and proactively addressing new information.

This requires a shift in mindset from “pyramid” to “network” leadership. As the environment shifts and morphs, unanticipated threats emerge, key talent leaves, acquisitions

happen and lawsuits are filed—the network leader doesn't solve the problem himself or herself. Instead, he or she spends time pushing information into the system, and pulling together the nodes that have the right understanding to tackle the issue. Cross-functional teams spring up, collaborate, solve, and disband. And this can happen spontaneously because there is an understanding of the situation, the organization's purpose, and the issue to be solved. This kind of adaptability will outpace efficiency any day.

LEADERSHIP SKILLS FOR THE INFORMATION AGE

To make the shift from efficiency to adaptability, corporate leaders must possess certain fundamental skills. What we see in organizations is an overly heavy reliance on functional, technical, or subject matter excellence; and attention to leadership fundamentals tends to be focused only within small groups of "high potentials" or the top of the house. But deep technical understanding in one's field of expertise doesn't prepare leaders for today's role of leader as gardener rather than chess master. Flourishing in the 21st-century market environment requires harnessing the talent in an organization (the seedbed), effectively pumping information into the system (water), and connecting those who may be siloed (cross-fertilization). Typically, as leaders progress in their careers, they gain experience in various areas that develop their technical competence. But as they grow and progress, their reliance on these things becomes less critical and another, more general skill set takes precedence.

Adaptable leaders must be rewarded on attributes like self-awareness and constant learning, not only on meeting a sales quota or exceeding a revenue target.

Adaptability comes from mastering this more general leadership skill set. If one has to pour thought and effort into decision making, maintaining a disciplined routine, or communicating effectively, there is little space to anticipate the unexpected. Only when an individual has mastery of these timeless leadership fundamentals will he or she become truly adaptable. Whether we consider Daniel painting the fence (*The Karate Kid*, 1984), YoYo Ma practicing scales, or Coach Wooden drilling his team, we see that those who have mastery understand that "fundamentals first" is the only way to prepare for situations that can't be anticipated. This is a radical shift from how many organizations incentivize and reward performance.

Quality leadership is about taking a long-horizon view. Many corporate systems reward based on meeting or exceeding short-term goals that rely heavily on depth in one area. We rarely see leaders asked to develop and perform against leadership fundamentals. It's time for a shift—adaptable leaders must be rewarded on attributes like self-awareness and constant learning, not only on meeting a sales quota or exceeding a revenue target.

Rather than focus on incremental improvement through more effort on old practices, many organizations need to make a holistic shift that has broad, significant impact over time. This takes commitment and a long-term view. Reorganizations, cost-cutting measures, and replacing executives answer a short-term need for action and deliver a brief spike in results. But meaningful, impactful change requires investment in both organizational process and leadership skills in order to be adaptable over time.

CONCLUSION

The hard part? Patience. Changing the way a complex system functions doesn't happen overnight—we're talking about altering the collection of behaviors that constitute an organization's culture. And that's no easy task. We are fortunate to be able to draw on the insights of a wonderful network of thinkers, leaders, and innovators. Conversations about long-horizon thinking, ecosystem orientation, and a move toward adaptability are happening in many academic, practitioner, and corporate circles. At the McChrystal Group, we are pulling those conversations together and continually iterating a model that answers the challenges posed by the business community today.



Jonathan Zittrain

From Edward Snowden to the Sony hacking story, societal dilemmas presented by the continuously evolving information technology revolution are not hard to identify. The future of the Internet, including the emerging “Internet of Things,” presents a complex picture for the quality community. With change happening so rapidly and in such a decentralized fashion, new and unpredictable products and services are sure to arise. Harvard’s Jonathan Zittrain, the co-founder and director of the Berkman Center for Internet & Society, sheds light on the future of information’s challenges and opportunities for the quality community.

THE FUTURE OF THE INTERNET:

Balancing Security With Openness in the Internet of Things

I wrote a book called *The Future of the Internet—And How to Stop It*. Its thesis was that our amazing three-decade run of the modern personal computer and Internet had been fueled by the “generative” characteristics of each—but stood vulnerable to security problems brought about by their very successes.

The PC allowed anyone to write and share (or sell) software for it—with the PC and operating system manufacturers having no role in deciding what would and wouldn’t run on their systems. That was unusual for its time or any time: The PC was introduced to a hobbyist community against a backdrop of nonprogrammable “information appliances” like dedicated word processors.

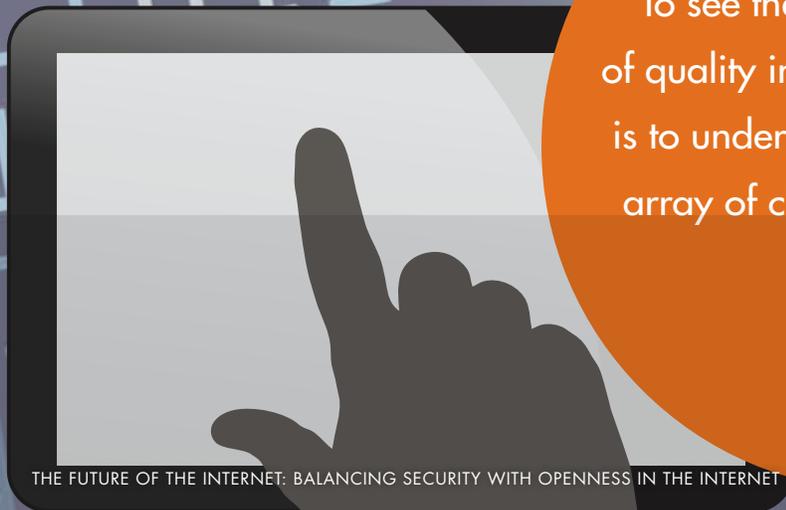
THE INTERNET

Same for the Internet. Unlike CompuServe, America Online, and Prodigy—the online services designed for the general public—the Internet allowed anyone to communicate



Balancing Security

To see the multidimensionality of quality in the information space is to understand the breathtaking array of choices and trade-offs.



with anyone, without any refereeing of the movement of bits or code. Unlike the proprietary counterparts that it soon eclipsed, the Internet has no main menu, no CEO, and no business plan. Anything could be built on top of it without permission of a central authority, and the resulting applications could, and did, surprise us in their reach and popularity. Foremost among them is the World Wide Web, designed by Tim Berners-Lee, a genius physicist working in his spare time, its protocols gifted to the world. (When Sir Tim appeared in the opening ceremonies of the UK Summer Olympics, tweeting out “This is for everyone” from the stadium, the network television anchors covering the event had no idea who he was.)

My worry in 2007 was that the openness of the PC to new code from anywhere, and the Internet to new applications and sites designed by anyone, was being increasingly abused. The Apple iPhone had just been introduced, and in its first version it brooked no outside code at all. I saw in the iPhone the return of the information appliance, a harbinger not just of dumb flip phones becoming smart, but of a rebooting of our entire information architecture from open to closed, unowned to owned, and innovative to stable—for the cause of better security.

The iPhone was indeed the beginning of a revolution. What made it most interesting was its second version, which introduced the App Store. The App Store represented a hybrid of the original PC, running outside code, and the information appliance, countenancing none. It put Apple in the position of vetting who could code for its products, long after they left the factory. It allows for great innovation—tens of thousands of apps—while permitting velvet ropes to be strung either by category or individually to exclude certain

Unlike the proprietary counterparts that it soon eclipsed, the Internet has no main menu, no CEO, and no business plan.

kinds of programs and services that don’t meet the preferences of Apple, or those who can regulate Apple. And we now see app stores across the gamut of information technology—they are in our phones, our tablets, and yes, our PCs, increasingly as the only practical sources for new code. The result is industry concentration in operating systems, and increased interest by regulators in monitoring and controlling what software is permitted to run—

and in turn, what content can circulate. As these architectures are exported to states that don’t embrace the rule of law, the implications for state control become more profound.

THE EMERGING INTERNET OF THINGS

This is a future I still want to stop, while still taking seriously the security concerns that have largely prompted this enclosure of technology. Looking ahead, we can see the

same dynamics shaping up for the emerging Internet of Things. Imagine an Internet-aware shovel. It may seem pointless at first, but it doesn't take much to imagine some good applications. Perhaps it can report when it's being used, so mom can check to see if the kids have dealt with the icy walk yet. It can sound an alert, personalized to the health profile of its wielder, if his handle-measured heart rate is going too high. (Maybe it can summon an ambulance if the hand grows cold.) Data aggregated across shovels can tell the city where to send the plows, on the logic that those shoveling the most must have the deepest snow. Or perhaps it's the opposite: Where people are too daunted to shovel is where the plows should go.

Will the shovel's features be determined only by its maker, or will there be an application programming environment made available for it? Will its data telemetry be owned and directable by the user, or proprietary to the maker? Our hypothetical shovel invites us to ask generally: Will Things be able to talk to one another across vendors, or only to their makers? Who owns a Thing—the purchaser? Or is it more like a service than a product?

Will the shovel's features be determined only by its maker, or will there be an application programming environment made available for it? Will its data telemetry be owned and directable by the user, or proprietary to the maker?

CONCLUSION

These questions remind us that so much is yet to be determined in our information ecosystem, and that the distinctions between owned and unowned, generative and sterile, remain as vital as ever. And they should inspire us to reflect on what we mean when we invoke quality. A quality shovel won't break down with lots of use and it won't be made of toxic parts. But a quality Internet-enabled shovel? That's much murkier. To some, security should be paramount—so having the shovel able to talk to the tea kettle only invites trouble, with little upside. To others, quality is optimized when open-ended populations of coders can try a hand at improving the way things (and Things) work. To see the multidimensionality of quality in the information space is to understand the breathtaking array of choices and trade-offs, and to begin working through the puzzle of just who should be making and guiding the answers among consumers, producers, regulators, and communities across each that are yet to gel.



Stephen P. Rosen

The global aerospace and defense industry is inherently complex. Militaries require exquisite and reliable technological systems because the missions they carry out are vital to the security of their countries. This guarantees that technological and geopolitical trends will drive immense change in the next decade. As an expert on the future security environment, Stephen P. Rosen, the Beton Michael Kaneb Professor of National Security and Military Affairs at Harvard, is well positioned to demonstrate what change in the industry will mean for the quality community moving forward.

THE FUTURE OF GLOBAL AEROSPACE AND DEFENSE: Implications of International Trends for Quality

International trends—including demographic contraction and the spread of high-tech knowledge and information—have generated conditions that will make quality and continuous improvement in the aerospace and defense (A&D) sector even more important in the future than it has been in the past.

Both intrinsic factors and competitive pressures have historically led the A&D sector to prioritize quality, understood as ensuring not simply uniformity of product but also the performance of components and systems as intended. By its nature, the work of developing and employing high-technology products at the limits of their performance envelopes and beyond requires the most severe and refined approaches to quality and continuous improvement. A&D systems operating for long periods of time in unforgiving environments such as earth orbits, the undersea domain, or the deserts, cities, and jungles where counter-terrorist and counter-insurgency operations occur demand the highest quality of which we are capable. The intensity of competition in the commercial aviation industry requires efficiencies of operation derived from components and systems that perform



Aerospace and International Defense Trends

Interconnectedness thus increases the need for quality at the component and the system level, so that errors and failures are eliminated before their effects propagate throughout the system.

reliably as designed and at the lowest possible cost. In short, the A&D industry has focused on quality because it was, and is, important for components and systems not to fail due to flaws in design or production.

Against this backdrop, several trends in the international security environment will only increase the salience of quality. First, political and economic constraints are driving the United States and other rich industrial societies toward unmanned autonomous systems. Component failure in such systems will not necessarily lead to the loss of human life but could result in mission failure that might be less crippling in manned systems. Second, the global spread of high-tech and engineering know-how and the incentive of hostile forces to exploit vulnerabilities embedded in systems will increase the need to identify and eliminate defects that can be exploited. We no longer face only the need to guard against component and system failures that are the result of physical weaknesses or defects; we must also use quality and continuous improvement to eliminate design features or flaws that can be exploited by intelligent and hostile adversaries. Finally, the interconnectedness of systems is more and more a force multiplier, but it also generates the risk of cascading effects if one part of the network falters or introduces faulty information. Interconnectedness thus increases the need for quality at the component and the system level, so that errors and failures are eliminated before their effects propagate throughout the system.

KEY INTERNATIONAL TRENDS AFFECTING QUALITY IN THE A&D SECTOR

Corporate planners must make investment decisions, formulate merger and acquisition strategies, and develop internal human capital in anticipation of what they will need to be able to do years from now. They know that the future will not look exactly like the present, but predictions and forecasts of market behavior are notoriously imprecise. Current events are flashy but also full of noise and possibly misleading. A more reliable point of departure for corporate planners are dynamics that can be observed over long periods to establish whether they are stable and

We must also use quality and continuous improvement to eliminate design features or flaws that can be exploited.

have internal characteristics that lead them to be self-sustaining. Moore's Law has held true for close to 50 years. It endures not because of laws of physics but because people believe it is true: If everyone believes that the number of transistors on a chip doubles every two years, then everyone will invest a huge amount of effort in figuring out how to make the next advance because if they do not, their competitors will. With all that effort along multiple lines, someone always has figured out how to make the next advance.

What can we say about trends in the international security environment and their implications for the A&D industry looking ahead 10 years?

POPULATION BUST

While the population of the world has grown, contrary to expectations, the number of children being born to women in all areas of the world except sub-Saharan Africa and in some Arab countries has declined. It has declined to sub-replacement levels not only in the industrialized areas of the world, including China, but also in much of the Muslim world, including Iran. Because of the surge in the number of children who were born and survived to adulthood in the 1960s and 1970s, world population is still growing, but on current trends it will level off, decline, and create a reduction in the number of men and women of working age relative to the older population born before the decline in birth rates. Labor will be more scarce, and capital will be substituted for labor. One way in which this will be done is through the use of autonomous systems for many activities now performed by people. While there is distrust of “robots” in the United States, other countries such as South Korea are already far down the road in the utilization of autonomous systems for military as well as nonmilitary purposes.



Such systems have functioned well and will do so as long as the interactions between those systems and the complex environments in which they operate are carefully reviewed. Autonomous systems have large problems when encountering unexpected issues. For instance, the loss of the American RQ-170 autonomous drone is said to have been the result of the drone’s going into an automatic landing when it encountered an issue while in flight. The fact that it was over Iran when this happened was a problem of quality requiring efforts to remediate the flaws in the software that led the system to execute undesirable actions. The more autonomous systems there are, the more continuous improvement of this kind will be necessary.

DIFFUSION OF KNOWLEDGE

If you visit the campus of any major American university, you will be struck by the number of students speaking Chinese or Hindi or Arabic. This is only one visible manifestation of the large number of very intelligent young people from around the world who have access to educators doing advanced research. Less visible to Americans are the students going to universities in Europe and Singapore. Add to that the multiple reports of the theft

of intellectual property by way of the Internet. Given the availability of smart engineers worldwide, Internet access, and state funding of national technology development programs, the leading industrialized societies should expect other countries to follow rapidly behind them in ways that will reduce their military-technological advantage. This will have particular relevance in the following areas:

- The diffusion of capabilities will affect the **competition in the area of precision strike versus stealth**. Briefly put, on the surface of the ocean, in the air, and for fixed locations on land, the application of information technology to military affairs—often referred to as the modern Revolution in Military Affairs—has given the most advanced militaries the ability to detect, characterize, and target military assets that are not low observable in nature. Other states are today acquiring the same suite of capabilities, ranging from reconnaissance satellites and reconnaissance drones to radars and other sensors. What states can find, they can increasingly hit and destroy with precision-guided weapons. Surviving in this environment means being low observable or stealthy. Stealth is a matter of design but also of paying attention to details that

As competitors become increasingly capable thanks to the diffusion of knowledge, the A&D industry will have to become more and more focused on eliminating small flaws in components and systems that may expose the location of systems.

inadvertently give the adversary a way to detect you. Submariners have long known that sloppiness is the enemy of stealth. Machine bearings that make noise and operational practices that generate transient acoustic signals can be enough to give away the position of a submarine. B-2 bombers require exquisite maintenance so that their stealthiness is not eroded by wear and tear. Airplane cockpits must be redesigned so that radar returns from sharp corners do not pass through radar transparent canopies. As competitors become increasingly capable thanks to the diffusion of knowledge, the A&D industry will have to become more and

more focused on eliminating small flaws in components and systems that may expose the location of systems. This is fundamentally an issue of quality.

- The diffusion of knowledge has also enabled the **rise of hacking and computer warfare cultures** in other countries. The United States is alleged to have conducted the first serious peacetime cyber attack against the Soviet Union in 1982 as part of Operation Farewell, by manipulating the computer codes that affected the gas pumping turbines imported by the Soviet Union, causing the largest recorded manmade non-nuclear explosion in history. The United States is also alleged to have been involved in the Stuxnet attack on Iranian uranium enrichment centrifuges. But cyber warfare has equally been employed by Russia against small neighboring

states, and by North Korea. The diffusion of knowledge is a trend that we can expect to continue and which will enable more and more sophisticated attacks on friendly computer systems.

- **Cyber warfare has emerged as perhaps the dominant form of nonkinetic attack** that can be employed in peacetime as well as in wartime. Although details of cyber attack and defense are classified, available reporting suggests that these attacks begin with a search for a weakness in the cyber defenses of the target. These can be human weaknesses, but flaws in software code give intruders access to the operating systems of the target. There is a constant search for aspects of code that are not conventional errors, in that they do not cause problems for the intended users of the programs, but which can be used by hostile attackers to manipulate the program against its owners. Eliminating these aspects of the programs is essentially a matter of quality, of carefully reviewing and evaluating a system to make sure its components are not unwittingly hazardous for the operator of that system.

DIFFUSION OF DATA

Finally, along with the diffusion of knowledge has come the diffusion of data—i.e., a deliberate effort to make it possible for people and systems continuously to report their position, status, and behavior to other people and systems, so that multiple actors can adjust their behavior in close to real time. This can bring about great improvements in efficiency, as long as bad data is not introduced into the system and as long as bad or misinterpreted data, when entered, is identified and neutralized. We have seen what happens when bad or misinterpreted data is not weeded out in highly connected, automated financial trading systems, when flash crashes have led to massive, transient, and artificial spikes in the price of shares of stock leading to massive and real financial loss. The entry of bad data into military systems was associated with the mistaken shoot-down of an Iranian passenger jetliner by the USS Vincennes in 1987, and with the bombing of the Chinese embassy by the United States in Serbia in 1999. The unintended consequences of the propagation of bad or misinterpreted data will become more and more of a problem as more activity is networked and automated, enabling rapid and dysfunctional propagation of data. Identifying and eliminating the problems that could be caused by more and more rapid sharing of data before it occurs is a problem of quality.

CONCLUSION

Quality is not just a matter of ensuring uniformity of production. It is a matter of ensuring that components and systems do not have flaws that will lead them not to perform as intended. Understood in this way, and taking into account observable international trends, the future of quality in the A&D sector will be even more important in the future than it is today.



Jim Davis

Manufacturing has long been at the core of the quality community, and today we stand on the brink of the era of “smart manufacturing,” thanks to the information technology revolution and the wealth of data that can now be collected, communicated, and analyzed. Jim Davis, of the University of California-Los Angeles (UCLA) and the Smart Manufacturing Leadership Coalition (SMLC), demonstrates quality’s enduring role in manufacturing domains that will be increasingly enhanced by information technology in the coming decade.

THE FUTURE OF MANUFACTURING:

Bridging Seams and Transactions to Integrate Next-Generation Information Technology

Next-generation information technology (IT) is about network-based data, unprecedented modeling capabilities, mobile computing, social networking, and IT clouds that go far beyond today’s infrastructure and software services. It is clear that the number of intelligent, connected devices is skyrocketing, with well-promoted estimates in the range of 30 billion by 2020. This explosion in systems of integrated devices, data, and information sets the stage for applications that provide unimaginable new insights and solutions, unprecedented opportunities, and relentless forces for changing how every major industry does business.

More narrowly, there is no longer any doubt that manufacturing is an industry that needs to adopt these new IT systems and technologies to meet future manufacturing expectations. It is in what way, at what speed, and how well the IT is applied that will impact the future of individual manufacturers and the supply chains in which they participate. In concept, smart manufacturing (SM) is the opportunity-based application



Next-Generation Technology

Can enterprise performance with new IT be predicted so that entry points for smart manufacturing (SM) systems can be identified?

of these technologies. In business terms, SM is the end-to-end use of real-time, networked, data-based intelligence for enterprise integration of dynamic market demands, high-velocity technologies, and added-value products in conjunction with increased economic, energy, and material productivity, zero incidents, reduced industry energy usage, and environmental sustainability.

ENVISIONING SMART MANUFACTURING'S POTENTIAL THROUGH A FOOD INDUSTRY EXAMPLE

SM and the roles for new IT capabilities in a manufacturing enterprise must grow from the interoperation of physical, cyber, and workforce elements. Myriad questions boil down to asking how these three elements come together to improve enterprise operations involving increasingly complex products and markets: Can enterprise performance with new IT be predicted so that entry points for SM systems can be identified? To this end, thinking about enterprise modeling in terms of basic changes in the nature of manufacturing “seams” and “transactions” offers insight into the new business of SM.

A seam is a location where two or more parts of a manufacturing enterprise or supply chain (processes, systems, or organizations) are joined together by a transaction. The transaction is the traditional approach to bridging a seam. It resembles a business purchase and delivery process in which minimal information is shared upstream or

SM and the roles for new IT capabilities in a manufacturing enterprise must grow from the interoperation of physical, cyber, and workforce elements.

downstream from the seam. Seams form as a result of different data definitions, standards, supplier products, factory operations, actionable windows in time, and operational constants. Seams and transactions exist in operational layers at the micro level (people to machines, or machines to machines), the meso level (across suppliers of similar components, or factory operations), and the macro level (across

factories, or supply chains). Material, energy, and information are often stored around seams to facilitate transactions.

The existence of seams and transactions is not a surprise, but the scope and scale of their existence in the sense of enterprise compartments—and therefore opportunities for optimization—is literally shocking. As an example, consider a food industry supply chain where consumers purchase a food product at a grocery store. The final product must meet specifications for composition and packaging, be free of contaminants, meet defined taste requirements, and comply with regulations. In production, variations in ingredients from multiple suppliers must be managed into recipes that produce a consistent product. Ingredients from multi-tier suppliers and growers must be procured, warehoused, evaluated to verify properties, and transported to manufacturers. Increasingly stringent regulations require traceability from the store to suppliers and growers, and variables such as weather patterns impact the process. The whole chain needs to respond to dynamic demands for the product in different markets around the world.

This farm to fork description of the food industry supply chain demonstrates the concept of seams being continuously bridged to produce a product. Seams create discontinuities among physical materials and facilities, cyber control systems and information flows, and the workforce in farms, transportation, and production. The industry currently manages seams and transactions throughout the chain from source to product and orchestrates the chain with a model that uses predictions of customer purchasing behaviors and sales to drive inventories and operations from customer to source.

The food industry example changes dramatically if we apply SM to automate, redefine, and in some cases eliminate seams and transitions. For example, early notification by suppliers of variations in ingredients can allow operations to prepare process adjustments before receipt of the ingredients. Or early notification by manufacturers of production problems can allow suppliers to adjust distribution of their products before shipment. This proactive approach reduces delivery time and cost, and can enable integration of traceability into operations. Ultimately operations can be driven by direct one-for-one product-supplied and product-purchased models that reduce shelf time, inventory, and spoilage. With SM systems, a supply chain with dynamic enterprise predictability suddenly offers unlimited, untapped opportunities for improvement.

INITIAL SM ADOPTION

Absent new enterprise infrastructure, SM adoption will proceed slowly because of awareness, risk, and return on investment (ROI) barriers. Capturing the future benefits of SM requires timely access and progressive development of new IT systems built to bridge seams in all enterprise functions. However, the complexities, the diversity of entrée points, and the cost of adoption will make it nearly impossible for companies to “own” all the necessary capabilities for SM implementation. In the recent ASQ 2014 Manufacturing Outlook Survey, 700 respondents representing diverse industries such as aerospace, automotive, food, medical devices, pharmaceutical, and utilities were asked about SM. Of those surveyed, 80 percent were not aware, did not see a need, or indicated that cost was a barrier or that management was resistant, even though the 13 percent who are already applying SM have experienced significant benefit.



In response, the nonprofit industry-led Smart Manufacturing Leadership Coalition (SMLC), of which ASQ is a member, is using next-generation IT to develop the SM platform to provide missing infrastructure and make it highly accessible. This infrastructure will provide real-time, data-based application development, deployment, performance, and

reuse implemented in “as-needed services” accessible through a cloud. Importantly, the SM platform is being designed as industry-driven, truly open infrastructure, i.e., with the following characteristics:

- **Open architecture**—vendor agnostic standards-based integration and interfacing with commercial and open-source platform technologies
- **Open access**—low-cost access to SM platform technologies
- **Open marketplace**—open access to composable, market-driven, commercial, and open-source application libraries inclusive of deployment, data management, modeling, analytics, and metrics applications along with associated nonproprietary deployment data, certifications, and services

SM platform infrastructure is designed to facilitate low-cost, secure, and timely bridging of seams and use of information to optimize beyond transactions. The nature of such a heterogeneous environment requires bridging across a wide range of technology, workforce, and organizational readiness levels. Ongoing discussions involving practitioners, suppliers, manufacturing consortia, agencies, laboratories, universities, boards, and committees now recognize the importance and promise of optimization through platforms and enterprise modeling. Below are SM vignettes describing current commercial activities involving enterprise modeling drawn from work by Mike Yost for the Manufacturing Enterprise Solutions Association and from the California Manufacturing Technology Consulting 2014 Survey:

LEVERAGE DATA TO INTEGRATE OPERATIONS

- “Real-time visibility to suppliers so demand volumes and timing are served with minimal inventory in the supply chain and consuming locations”
- “Electronic chain of custody from suppliers including quality variations so production processes can be adjusted prior to receipt of components or materials”

OPTIMIZE EFFICIENCIES ACROSS AN ENTIRE CHAIN

- “Data and information from across a supply chain to build intelligence in end-to-end business processes, and unlock new solutions to drive optimization”
- “Synchronized supply chains with real-time demand forecasts to reduce problems such as order changes, expediting, premium freight, and just-in-case inventory”

COOPERATE TO IMPROVE INDIVIDUAL MANUFACTURING PROCESSES

- “Batches reduced to one-piece flows by communicating consumption transactions, quality variations, and response priorities to suppliers instantaneously”

- “Corrective action workflows triggered from process variations to integrate functional personnel in real time, regardless of global location”

HIGH DEGREES OF PRODUCT CUSTOMIZATION

- “Increased product complexity managed by digitizing production processes and using this intelligence to give customers more freedom to customize products and manufacturers more ability to deliver them”
- “Control over production processes, changeovers, and varying order sizes to match output with demand and be more responsive to customer needs”
- “Sequenced production to synchronous assembly of automotive instrument panels, door panels, and consoles with the flow of components across a supply chain”

CONCLUSION

Seams and transactions are so ingrained in the structure of manufacturing industries that they often go unnoticed in the context of current operating models. Even the International Society of Automation’s ANSI/ISA 95 System Layer Classification manifests itself as multiple, discreet layers of supplier products and systems (seams) that must be bridged (transactions). These long-held models are a barrier to entry for SM, and one of the reasons that SM is still in the early stages of awareness and adoption, as shown in the ASQ 2014 survey.

However, if we relax current business models, then seams and transactions provide core insights into the interoperation of new IT capabilities with physical, cyber, and workforce elements. They also provide a point of entry with predictable performance improvements for SM systems. Modeling across seams is likely to start small, but as more and more seams are bridged, built up layer by layer, and extended across an entire supply chain, a new enterprise model emerges. A true industry-driven ecosystem can form and create a virtual enterprise model that incorporates physical assets as components to execute production of the right product, at the right time, in the right amount. In manufacturing industries, this model has the potential to shift business value from physical facilities to virtual enterprises.

The nature and diversity of seams and transactions that need to be bridged return us to the point that the ability to capture the full potential of SM involves infrastructure that no one practitioner or provider company can “own” or provide and still meet all of the necessary capabilities for SM implementation. Also, current market drivers do not align. We project the need for industry-driven and orchestrated infrastructure that is architected for market-driven, commercial, and open-source platform and application partnerships to unlock numerous untapped opportunities for greater economic prosperity, product value, environmental sustainability, and broad-based protection of material and energy resources. Smart manufacturing is not just about individual interests.



**Izabel Christina
Cotta Matte**

Trends in city dwelling and local government budgets may be headed in opposite directions. As urban government leaders face increased challenges with decreased resources, new models of governance may be needed. To learn more about how quality is viewed from the perspective of a city's leaders, Izabel Christina Cotta Matte, the chief strategic planning and budget officer of Porto Alegre, draws from her experience as a public management leader in Brazil.

THE FUTURE OF CITIES: Quality, Planning, and Excellence in Public Sector Management

As global urbanization continues apace, the coming decade will see city governments across the world facing a cacophony of old and new challenges in managing resources and delivering services to their residents. Brazil's southernmost state, Rio Grande do Sul, is home to one prime example of governance adapting to and thriving in a dynamic context. Porto Alegre, Rio Grande do Sul's capital city, is striking in its diversity. The city was first settled in 1772 by 60 couples from the Azores. In the early 19th century, African, German, Italian, Jewish, Lebanese, Polish, and Spanish immigrants began arriving in Porto Alegre. Today the city boasts a population of over 1 million from myriad religious, linguistic, and ethnic origins. Porto Alegre is a cosmopolitan and multicultural regional capital whose government has upgraded its management practices to ensure better quality public services for the future, which, in turn, will contribute to greater social and economic development.

Before looking at how Porto Alegre goes about planning for the future, it is helpful to have some understanding of its overall context. Apart from gaining recognition for promoting a participatory budget over the last 25 years, the city is also known for having hosted the World Social Forum and for systematically increasing community



Public Sector Management

"To be recognized as a reference for its high quality of life, its excellent public services, and building a sustainable and participatory environment, ensuring plurality, through strong local governance."

—Porto Alegre long-term vision

participation in its administration. Another defining feature is the city's strong tradition of urban and environmental planning. Porto Alegre was the first capital in Brazil to establish a master plan. Approved in 1999, the Urban Development and Environmental Master Plan acted as a foundation for Porto Alegre's future vision. It incorporated a strong focus on development with clear guidelines and strategies for implementing projects while emphasizing popular participation and economic, social, and environmental sustainability.

These guidelines are key principles that direct the city's strategy to build the metropolis we imagine for the future. In 2005, a political and administrative decision was taken that Porto Alegre should sign an agreement with the State Quality and Productivity Program and the Movement for a Competitive Brazil. Thereafter, the city began developing a management model that focused on results. This was a major innovation because at that time the idea of quality-focused management was still incipient in Brazil.

We had two main challenges: to reinforce our culture of participatory democracy and to improve the quality of our public management. At that time, public policy was implemented across departments in a disconnected or uncoordinated manner, often leading to unsatisfactory results.

PORTO ALEGRE'S MANAGEMENT MODEL

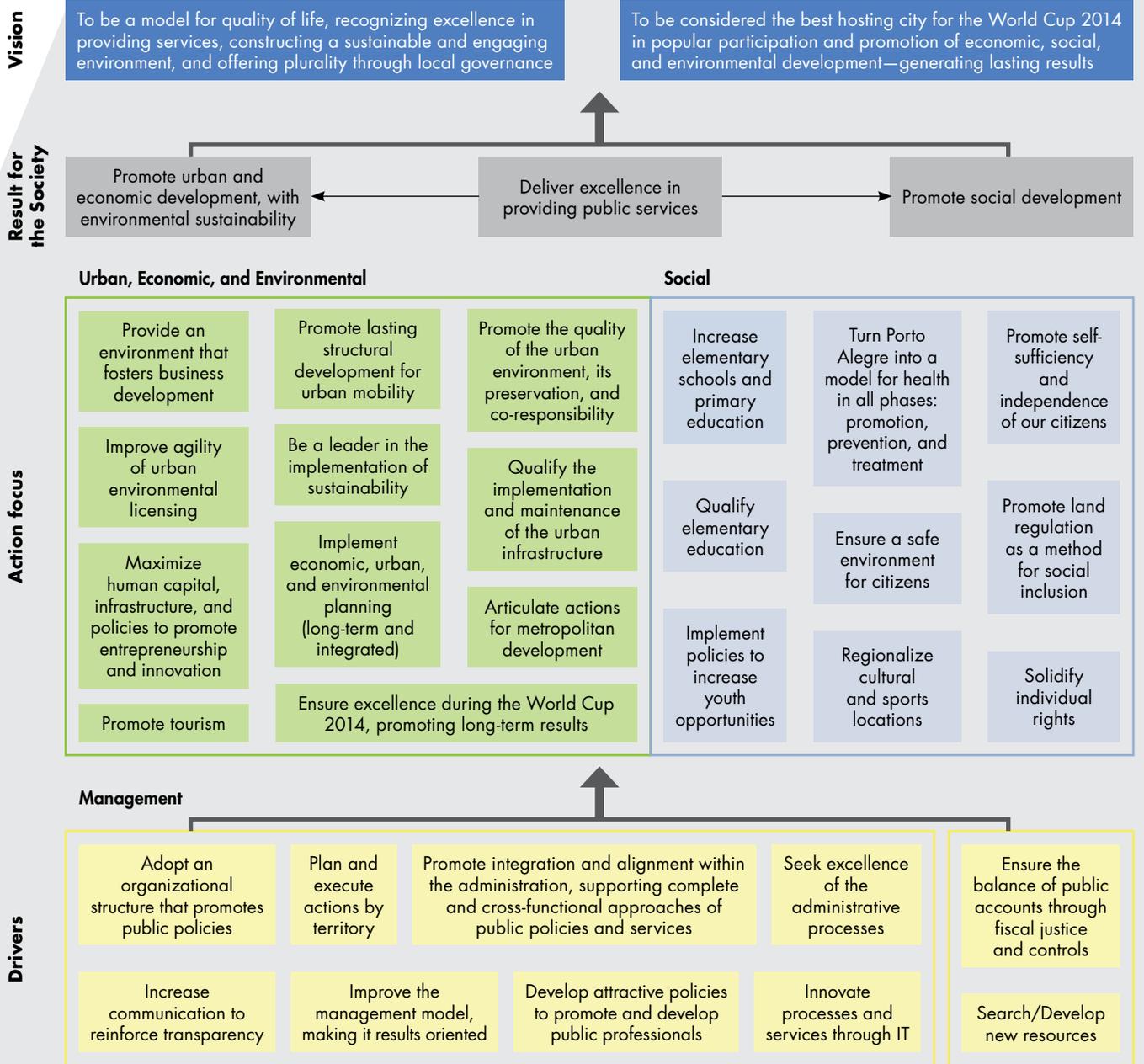
Over the last 10 years, Porto Alegre has reorganized how the city is managed. First, we defined a new management model. Designed horizontally, it broke down functional or departmental silos. In addition, the city also developed a new governance system that would allow it to improve its management of technical issues, to enhance senior management decision making, and to ameliorate the dialogue between government and society.

The four premises of Porto Alegre's management model are:

- Executing public policy in an integrative and cross-functional manner
- Differentiating between city zones
- Promoting transparency—enabling citizens to access information on key projects and initiatives
- Ensuring the leadership's empowerment of public servants in their respective fields of expertise

Porto Alegre's strategy map (as per Kaplan and Norton's balanced scorecard methodology) sets out the city's key strategic objectives and its long-term vision, which is, "To be recognized as a reference for its high quality of life, its excellent public services, and

Balanced scorecard for the city of Porto Alegre, Brazil



Courtesy: City of Porto Alegre, Brazil

building a sustainable and participatory environment, ensuring plurality, through strong local governance.”

The five-year plan and the budget were reorganized along the lines of cross-functional strategic programs, thereby breaking down vertical departmental silos. A public servant, who has received specific training in our chosen methodologies and tools, manages each of these programs. Every initiative has an identified leadership to work together with other leaders and a program manager. Over the years, many public servants have received training on this model, thereby ensuring that we retain knowledge within the organization, independent of political changes that can occur every four years. Furthermore, we have adopted a systematic approach to training and recognition to stimulate meritocracy, giving recognition to managers whose performance is outstanding. In 2008, for example, 15 civil servants were awarded sponsored enrollment in a 15-day course on public administration at George Washington University.

Over the last 10 years, a systematic update of the strategy map has taken place, as well as a realignment of the city’s strategic programs. To further increase alignment, a decision was taken in 2013 to merge our strategic planning and budgeting departments into a single unit, thereby ensuring our priorities are rigorously planned within budgetary constraints—something we consider a major step forward for the public sector.

As a result, we have laid to rest a planning culture based on narrow departmental priorities. Every day, managers and civil servants participate in various mid- to top-level meetings to evaluate planned initiatives, review performance indicators, and seek out the best possible result.

Another innovation was the adoption of management contracts for all municipal departments. Heads of departments lay out their goals for the year ahead, signing a management contract that is their commitment to society. Each year, the mayor, deputy mayor, the heads of departments, and managers attend an event at which the previous year’s results and the coming year’s targets are publicly announced. In addition, awards are handed out to the teams with the best performance.

ACHIEVING RESULTS AND BUILDING FOR THE FUTURE

Another important achievement was an improvement in our fiscal management. After three consecutive years of deficit, Porto Alegre posted a surplus. This improved fiscal position made it possible for us to access loans and, therefore, invest in large-scale infrastructure projects required to build the city of the future. Structural improvements, first proposed in our last master plan, to increase Porto Alegre’s drainage system’s capacity to absorb rainwater, and to increase urban mobility, were given further impetus when Porto Alegre was chosen as one of the host cities of Brazil’s World Cup in 2014. More than \$500 million was invested in projects, such as bike lanes, upgrades in public

transport, and the expansion of sewage treatment capacity. Furthermore, investments in resettlement programs and jobs training have provided new opportunities for residents located in high-risk areas.

Through our integrative approach, the problem of children living on the streets was turned around. In 2004, 670 children were identified as living on the streets. By 2012, such cases were rare. We were able to expand basic healthcare provision, growing the number of family healthcare teams working alongside doctors and nurses in different areas of the city to 205. When the management model was first implemented, there were only 84 such teams. Today more than 21,000 children up to the age of six are in daycare centers, as opposed to 15,000 in 2006. Another 46,000 kids between the ages of seven and 14 are studying in local schools.

Quality concepts and the spirit of continuous improvement will be crucial to consolidating a new culture of public administration.

The municipal plan for the creative economy targets the installation of creative incubators in areas in need of urban and environmental regeneration. Moreover, by automating the city's urban environmental licensing procedures for building projects we were able to foster new economic growth and, with it, an expansion in jobs as well as incomes. The implementation of an integrated center for video surveillance provides daily live-action footage of different areas across the city. Such initiatives led to Porto Alegre being recognized as a "resilient city" by the Rockefeller Foundation, giving us special status among a peer group of 100 cities worldwide considered most ready to deal with natural disasters.

CONCLUSION

The city of the future must provide sustainable development and citizens' emancipation with coordination between government, private initiative, and civil society. Porto Alegre of the next decades will have prepared citizens through universal access to healthcare, quality education, and vocational training that meets the demands of the labor market. The population will be culturally strengthened to act responsibly in an environmentally conscious way. They will be able to monitor global changes and economic and technological development. These citizens will enjoy a public transportation system able to minimize the negative impacts of mobility of big cities. Public spaces will be landmarks where people can celebrate and interact with the environment.

City dwellers will be the protagonist of change in the coming decade, committed and informed about their responsibilities. The approach to public management implemented by smart cities in the next 10 years will lead us to advance in social development, sustainability, and economic growth. Recognition, knowledge, and information are prerequisites if we are to continue improving. In this context, quality concepts and the spirit of continuous improvement will be crucial to consolidating a new culture of public administration.



Devi Shetty

Healthcare stands out as the segment of the economy positioned to grow and evolve the most in the coming decade. This period of growth has the potential to usher in unprecedented enhancement of quality of life for millions of people. How the developing world views quality and its role in healthcare will be critical. Devi Shetty, a renowned cardiac surgeon and founder of Narayana Health, India, offers his view of challenges facing any effort to expand care throughout the developing world.

THE FUTURE OF HEALTHCARE:

Toward a Global Medical University

Cardiac care standards are very high in India, but cost impediments have often prevented those in need of surgery from obtaining it. My hospital system, Narayana Health, seized upon economies of scale—derived from a larger medical campus with greater utilization rates of high-cost equipment—to deliver expanded access to care without sacrificing quality. Scaling health access more broadly moving forward will require rethinking business models and similarly expanding and efficiently utilizing pools of resources. Education and the supply of skilled medical professionals are

Scaling health access more broadly moving forward will require rethinking business models and similarly expanding and efficiently utilizing pools of resources.

key factors influencing the ability of international healthcare entities to innovate in terms of care and cost structures. This is obvious on a global scale where one can observe a wide variation in quality of care available across different healthcare systems. What follows is an exploration of one path toward delivering more affordable care worldwide. The waypoints along

this path all attest to the enduring value of quality—in teacher-student relationships, in practitioner-patient relationships, and throughout the management and medical



Global Medical University

Less than 15 to 20 percent of the world's population can afford any of the surgeries of the heart, brain, joint replacement, or those standard in cancer treatment.

architectures empowered to deliver innovation in care and cost while maintaining the highest degrees of quality and attention to continuous improvement.

THE CHALLENGE OF QUALITY IN GLOBAL HEALTHCARE

More than 100 years after the first heart surgery, less than 15 percent of the world's population can afford it. In fact, less than 15 to 20 percent of the world's population can afford any of the surgeries of the heart, brain, joint replacement, or those standard in cancer treatment. The dearth of access to these often life-saving treatments is no surprise when one considers that surgical procedures on the human body require precise skill and certification, which are in high demand and provided at significant cost by medical schools, nursing schools, and paramedical schools. Such institutions are scarce across the world, especially in developing countries, and very tightly regulated to guarantee high quality.

To drive radical change in global access to care, it will be necessary to expand the pool of trained personnel in developing countries. The quality of healthcare delivered in any country is directly proportional to the quality and quantity of skilled manpower available. Countries with little skilled manpower cannot have high-quality healthcare—unless they are wealthy enough to pay to import doctors, as is done in the Middle East. Cuba, with the highest doctor-patient ratio in the world, has proved that high-quality healthcare can be achieved by opening the medical, nursing, and paramedical education systems and producing surplus manpower that can serve the needs of Cuba and its surrounding countries.

Expanding the pool of manpower in currently underserved countries can be accomplished through the development of medical, nursing, and paramedical schools across the developing world, under the umbrella of a virtual global medical university. Creating a university is an expensive affair. It requires capital investment and sophisticated infrastructure that leaves medical education at these universities under the control of a select group of professionals and organizations. Even launching new, innovative courses in medical education is a significant task; creating new institutions of medical education is all

To drive radical change in global access to care, it will be necessary to expand the pool of trained personnel in developing countries.

the more difficult. I experienced this difficulty when I was governor of the Medical Council of India, the apex body regulating Indian medical education.

THE CONTRIBUTION OF A GLOBAL MEDICAL UNIVERSITY

To address this challenge through a global medical university, it will not be necessary to commission massive buildings and hire hundreds of full-time employees. If the GMAT exam can be conducted in more than 150 countries without massive infrastructure, everything in distance medical education is possible. An effort of this nature focused on the developing world will require global support, however, including from the stalwarts of medical education in the United States, Europe, Asia, Africa, and Latin America. Partners who are true visionaries and progressive could be called on to contribute to the curriculum and syllabus for medical, nursing, and paramedical education programs.

According to the U.S. Bureau of Labor Statistics, out of the 20 fastest-growing occupations in the United States, 15 are in healthcare. Unfortunately, a corresponding training program exists in India for none of these 15 occupations. One example of this disparity can be seen in the United States, where almost all surgeons have a physician assistant (PA) who helps them prepare patients for surgery, assists in operations, and takes care of patients in the ICU and other post-operation and outpatient settings. The experience of the United States demonstrates that PA contributions can significantly reduce morbidity and mortality rates following any procedure in any hospital across the world. Despite this reality, PA training programs are virtually non-existent in India. Governments across the developing world are desperate to initiate and expand paramedical education programs that can significantly reduce mortality and morbidity rates at relatively low cost. For this reason, paramedical training may present a ripe domain for learning how to bring together the respective authorities across the developing world, create a curriculum, and conduct educational programs globally. Demonstrating that such an effort can be accomplished with adherence to quality in training and outcomes may go a long way toward nullifying the negative forces that have stunted development in care in the developing world.

Unfortunately, universities across the world often deliver knowledge without the translation tools to help their students develop reliable skills.

IMPLEMENTING A GLOBAL MEDICAL UNIVERSITY

Unfortunately, universities across the world often deliver knowledge without the translation tools to help their students develop reliable skills. A global medical university serving the developing world is based on the requirement to train people with great skills and impart some knowledge, not the other way round. Since the goal of the program is local

outcomes, it will be important to incorporate 20 percent local content catering to the needs of the local population alongside a core 80 percent standard curriculum.

Developing and implementing a curriculum that can be recognized globally will require working with various governments in Asia and Africa. That enables the graduates to be recognized within their localities and to deliver relevant care legally. A global medical university may require an anchor sponsor to provide leadership and the support of local governments as discussed, but it will also require the support of international entities such as the World Health Organization (WHO), the World Bank, the International Monetary Fund (IMF), and other organizations that finance healthcare initiatives across the world. The goal in building strategic partnerships with these multinational bodies would be recognition of the global medical university as a precondition for countries seeking grants and loans.



CONCLUSION

Skilled manpower is in short supply across the world. If you look at the process of delivering healthcare, finding skilled manpower constitutes the majority of the challenge. People with skills will invariably find ways and means to offer their services by working with local bodies, governments, and anyone who can help them. This is the only way skilled workers can earn a living, building their reputations and developing stature as high-quality leaders in their fields. Building a greater pool of skilled manpower through a global medical university addresses one of the main challenges limiting the quality of healthcare in the developing world. Once you have skilled manpower, you can deliver medicine, perform procedures, carry out immunization, and monitor every aspect of healthcare remotely because of the knowledge workforce. Ultimately, delivering healthcare is not about building hospitals, buying medical equipment, or developing

new medicines. Rather, it's about building manpower that can use the machines, use the hospitals, and dispense the medicines. Until a skilled workforce is achieved in developing countries, no matter what other steps we take, quality healing processes will not reach people in need.

A WHO Report from 2006 forecasted a shortage of 4.3 million skilled health workers by 2015 in 57 countries that are critically short of manpower including physicians, nurses, and paramedical workers. While more recent studies have shown that the shortage may not be as great as expected, there will still be a major shortage of healthcare workers throughout the world.

Developing countries can lead the world in dissociating healthcare from affluence. We can prove to the developed countries that the wealth of a nation has very little to do with the quality of the healthcare that citizens enjoy. Delivering on this challenge can begin with a focus on education and training programs in the developing world.



JoAnn Sternke

There are common ingredients to successful learning environments at all levels of education. The eagerness of students, the dedication of teachers, and the nature of the context that brings them together all go a long way toward determining the quality of learning outcomes. JoAnn Sternke, the superintendent of schools at Pewaukee School District, Wisconsin, USA, offers a view of the future of education marked by new technologies being incorporated into learning environments and digital natives increasingly taking the reins of classrooms across the globe. The Pewaukee School District received the Malcolm Baldrige National Quality Award in 2013.

THE FUTURE OF EDUCATION: Quality Teachers for the 21st Century

I was always one of *those* kids who loved everything about school. Sure, there were children around me who complained about the routine. I just didn't understand them. For me there was so much to relish, starting with the trappings—the new notebooks, the ritual trip to the store with my mom to select just the right school supplies. My mother would always treat me to something extra special that wasn't on the lengthy, predetermined

The trappings of school contributed for me to the sense of expectation that every new school year brought.

school supply list. What would be the coveted purchase this year? A special Bic pen that writes in four colors, not just one? A Trapper Keeper, that "one-stop shop" binder? An extra special folder, not in a mundane plain color, but one with the newest heartthrob on it? The trappings of school contributed for me to the sense of expectation that every new school year brought.

I remember that when we would get our textbooks on the first day of the year, I would hop right on my Schwinn bike and ride two miles to the Ben Franklin Variety Store. Why? Because I had to get about a yard-and-a-half of that special slightly smoky



Personalized Learning

In the future we will have more data about student learning than ever before, and we will have better systems to help us analyze it.

yet clear plastic oilcloth to cover my books. It was a ritual that my dad and I enjoyed together. I loved sitting at the kitchen table with him covering my books on the first night of school. Folding the corners just right was, in truth, a basic geometry lesson. Yet I also relished perusing the pages and pondering all the new things I would learn that year. It built excitement ... and great memories of my dad.

And then there was the classroom. Sitting at my desk with the lid and organized contents, I could stay in my row and listen to a great teacher all day. The way Mrs. Ehm brought U.S. history to life. The way Ms. Roach made those tough math concepts clear for me, always with the use of chalk or Saran Wrap on an overhead projector. The way Ms. O'Donnell inspired an appreciation of literature. To this day I love reading novels because of her. Teachers were revered in my home, and I grew up believing that being a teacher was a special calling.

Flash forward 40-some years to the present. No surprise here—I entered the field of education. I became a teacher, and then an assistant principal, and now I serve as a superintendent of schools in a wonderful K–12 award-winning public school system, the Pewaukee School District. For a long time I didn't realize how much my childhood shaped who I have become. Today I fully recognize that my education experience was

The advent of digital technology, big data, and customization—will impact education at all levels and of all types.

more than a bit idyllic in comparison to that of many others, and that because of it I still love going to school each day, even now. That's my bias and I'm proud of it, and it is my mission to create those experiences for the students who attend my schools.

Yet some of the experiences I treasured from my youth will not be a part of the experience for students in the future. No longer will students be covering books, as most content will be delivered online with students using technology to access information. How about practicing penmanship with that special pen or pencil? Penmanship, too, is in the crosshairs, as the keyboard is becoming the communication tool to master. And students certainly won't be filing papers in paper folders; they're already using digital ones instead. It's clear that the trappings of education will change greatly as we look to the future.

But beyond the trappings, it is also clear that the fundamentals of the education landscape are rapidly evolving. While I can speak to public education from experience, I believe three key changes—the advent of digital technology, big data, and customization—will impact education at all levels and of all types. The larger and more important question is, what will transcend? What may stay the same in education in the future? Let's begin with the changes.

TECHNOLOGY CHANGING THE LEARNING SPACE AND PROCESS

No doubt the influx of technology and digital resources is changing how students learn, and this will only grow in the future. The impact of technology, to be honest, is old news. Technology is already in the hands of students. In fact, schools are being built with bandwidth to accommodate four technology devices per person. People have phones, personal technology, computers, and more. The technology will keep on coming, and it will be smaller and more powerful. Yet in my school district we say, "It's not about the stuff (referring to technology). It's what you do with it." It won't be about the stuff in the future—it will be about what we do with it.

Where we are on the cusp of seeing great change in education is in the impact of technology on the teaching and learning process. Learning will become more personalized and learner-driven. As students have access to a greater amount of content

and global connectivity via technology, they will demand to drive their learning more and more. Independence will grow. Student voice will grow. All of this is a good thing, but it will change the teaching model. Currently, the teacher parses the knowledge, and the students are receivers, all in a group setting, all at one time. In the future, first of all, the space where learning occurs will change. There isn't the need for 100 percent of learning time to be in a group. Sure, students will need to learn collaboration; that is a key job skill. Yet particularly as students age, they won't need all their learning to take place in a traditional classroom setting. Right now the Khan Academy offers people the opportunity to learn 24/7 whenever, wherever. Schools will need to reproduce this accessibility of information ... or students will just get it elsewhere.

I am most excited to see how "personalized" learning will take place in the future. In this model, students will be able to direct their own learning. As such, teachers will be more facilitators than traditional pedagogues. Moreover, students will be able to learn at their own pace; and that, I feel, is a very good thing. For too long we have been "one size fits all," with the "fit" taking second fiddle to the "one size." I like the idea of meeting student needs using time as the variable, not the constant. That part of the future excites me as an educator. Personalized learning has the potential to better meet student needs.

Personalized learning has the potential to better meet student needs. That part of the future excites me as an educator.

DATA TO BETTER INFORM INSTRUCTION AND THE LEARNING EXPERIENCE

Seriously, would you expect someone who believes in the Baldrige Criteria like I do to not say that results will shape the learning experience? I believe in the future we will have more data about student learning than ever before, and we will have better

systems to help us analyze it and make instructional decisions based on each student's results. In light of this, we will better know students' needs—and that will in turn require us to adapt our systems to better serve students.

This adaptation will hopefully entail better customization and personalization of learning. I see better systems for data analysis as the "big data" movement comes to education. That is exciting if we know how to use the data to inform. We don't need bigger data warehouses. We need better analysis, and we need a more expedient response when we see kids not learning.

I also predict that schools will have more graduation options than a traditional diploma for qualifying seniors.

MORE DIVERSITY, MORE CHOICE

When I grew up, in that idyllic world of my youth, my parents had two choices. I could go to public school for free, or I could go to private or parochial school on my parents' dollar. Now there are many more options for a child's education. These options will only continue to grow. Specialization will become more prevalent as will more flexible options within schools themselves.

I also predict that schools will have more graduation options than a traditional diploma for qualifying seniors. I see education moving to more of a certification role, rather than a traditional diploma where everyone jumps through the same hoops to get that sheepskin. Specialization will continue to grow and occur earlier and earlier in the educational experience. In the workforce, a diploma will be less important than the possession of knowledge and skills that an employer will be able to recognize, thanks to our reliance on data systems.

BUT WHAT TRANSCENDS?

Amidst all these changes, what will transcend? Will schools exist as we now know them? What will children in 2030 experience in their education? No doubt there will be profound changes—changes in learning spaces, in delivery model, in what is learned and how it is learned. Certainly customization and personalization will be the norm.

But here's the comforting news: We will still depend on schools. Our society is based on schools for custodial care of young people. I may be naïve, but I don't see that changing. It's part of our social fabric.

Even more important, though, I don't see great teachers ever being replaced. Sure, their skills will need to change. They will need to facilitate learning more than stand

and deliver it. Yet I believe that teachers will hold a dear place in the hearts of students and parents for years to come. Education, while it will become more technological and more personalized, will still depend on great teachers to instill direction, passion, and excitement in the learning process. Teachers will continue to ignite learning, just as they do today. That is something I find comforting.

CONCLUSION

It excites me to think of digital-native students becoming digital-native teachers. They will see interconnectivity as something to be celebrated. They will not see technology as something new to learn—it was how they learned. These new teaching post-millennials will be the transformers of learning. That is an amazing thought, and so exciting.

So you see, even though students of tomorrow may not experience covering textbooks, buying new manila folders, or sitting at traditional desks like I did, I hope they will find their learning to be relevant and vital in preparing them for their future. Educators give students life chances ... and that must remain true in the future.



Zheng Mingguang

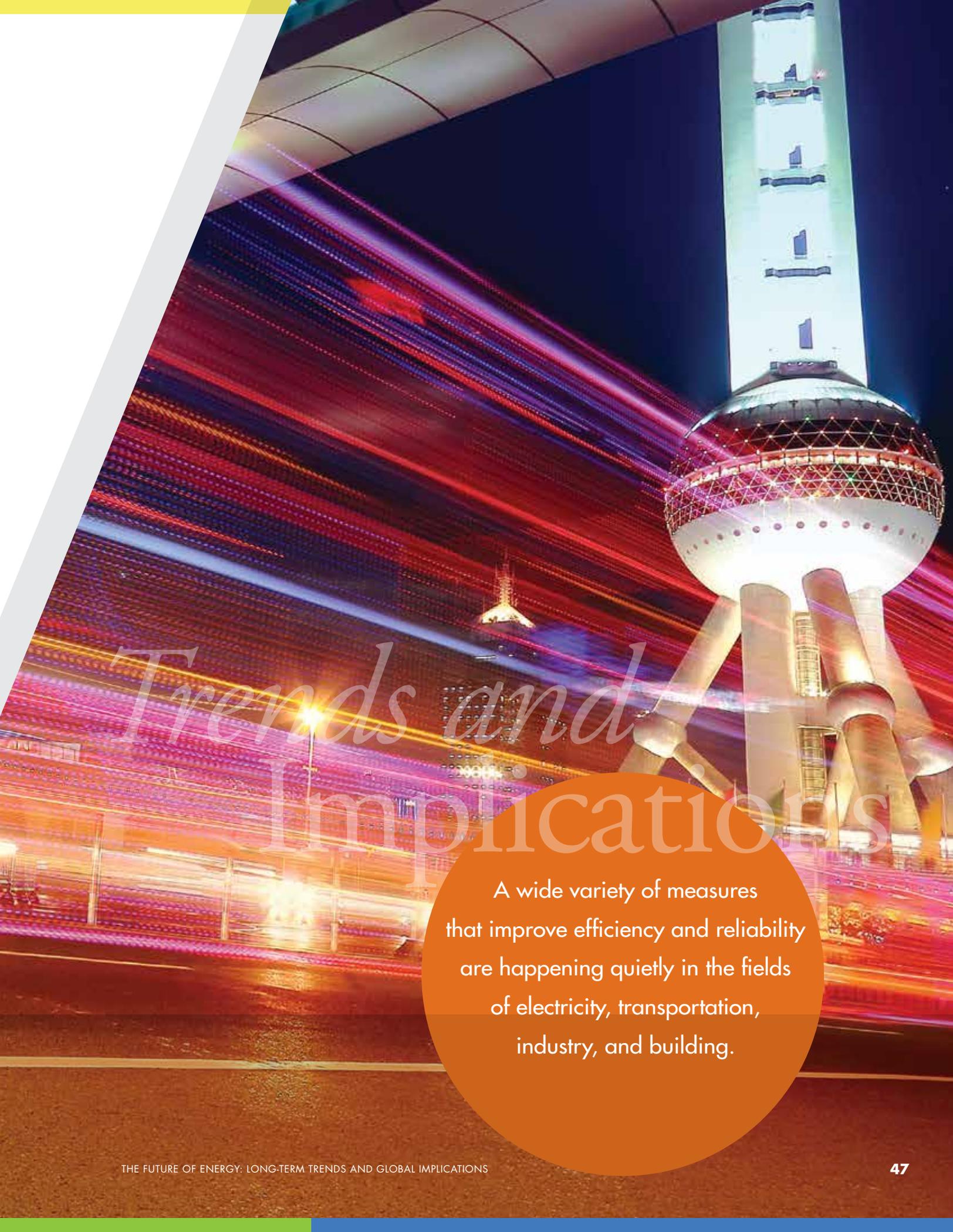
Globalized production and consumption of energy resources has led to increasingly complex ties between far-flung geographies and industry sectors. Advances in technology and the pursuit of efficiency will deliver new modes of production and consumption in the future, as the need for sustainable solutions to energy challenges becomes even more pronounced. Zheng Mingguang, president of the Shanghai Nuclear Engineering Research and Development Institute, reviews energy trends and their implications for the energy systems that touch every part of the global economy.

THE FUTURE OF ENERGY: Long-Term Trends and Global Implications

Energy provides the basis for all social activities, and a secure, reliable supply of energy is indispensable for a nation and the happiness of its citizens. We demand many things of the systems that supply our energy. We want them to be affordable, clean, reliable, and sustainable. While these goals have often been in conflict with each other in the past, micro-changes that improve efficiency are resulting in breakthroughs that make it possible to achieve all of our goals for energy supply. A wide variety of measures that improve efficiency and reliability are happening quietly in the fields of electricity, transportation, industry, and building. These are all changes that depend on quality understood as optimizing the energy efficiency of system design and the reliability of nuclear reactors.

IDEAL ENERGY GOALS AND LONG-TERM TRENDS

The following trends give us objective reasons to state that we will make progress toward our goals:



Trends and Implications

A wide variety of measures that improve efficiency and reliability are happening quietly in the fields of electricity, transportation, industry, and building.

- The portfolio of energy will be dominated by renewable energy, while fossil energy becomes complementary. Increasingly diverse sources of energy will mean more options for energy consumers and more flexibility in the supply of energy.
- The production of energy will shift from “mining” resources to “manufacturing” them, which will mean there will be an increasing emphasis on technological innovation. Dispersion of energy production will increase, and capital intensity will decrease.
- The utilization of energy will change from being isolated, closed, and linear to an intelligent synergistic mix of complementary sources and uses of energy, based on system efficiency optimization. Instead of oil, electricity will be the core of the energy system.
- The nature of energy will be shifted from being focused on acquiring and distributing commodity resources to being centered on knowledge-driven and technology-based renewable energy. This will mean that research and development (R&D) will be more important than ever before.
- Developing countries will be the center of new energy demand.

The nature of energy will be shifted from being focused on acquiring and distributing commodity resources to being centered on knowledge-driven and technology-based renewable energy.

SOLUTIONS FOR THE NEW ENERGY ERA

Oil and electricity are the main drivers of energy use. According to the Rocky Mountain Institute, carbon emissions of oil and fuel power plants account for more than 40 percent of the total in the United States. Further, nearly 75 percent of U.S. oil is used for transportation, and about 75 percent of U.S. electricity is consumed by buildings, with the remainder mostly going to industry. (In China, 70 percent of electricity is used

by industry.) Therefore, efficient uses of energy in transportation, buildings, and industry are the keys to conserving oil, coal, natural gas, and electricity. Keys to efficiency include smart grids, distributed technology, renewable energy combinations, the Internet of Things, (see “The Future of the Internet,” pp. 12–15) and smart buildings.

ELECTRICITY

Given current conditions and global trends, the best solution for electricity involves a mix of centralized and distributed renewable energy. By means of advanced smart control

systems, electricity systems will ensure that national and regional grids work together to ensure a real-time balance between demand and supply. At the same time, micro-grids that can be operated independently will improve system flexibility. Specifically, the following developments are likely to improve electricity efficiency:

- **Information technology** will promote efficiency through the development of electricity system monitoring, control, and transmission. Through smart chip data communication, the smart grid will manage itself and stay stable.
- The system will be based on modular technology. Instead of small numbers of custom-built, large-scale, centralized power plants, there will be **multiple, distributed, small energy systems** that are mass produced. These multiple small units will be combined into a system that is capable of quick learning. The combinations of small units are unlikely to all break down simultaneously, so system reliability will be improved compared to systems based on small numbers of large units. Distributed high power density batteries, distributed generation, and micro-grids will facilitate this new network.
- **There will be more options for electricity users.** Electricity companies and other traditional service providers will not only provide a wider range of services and price systems but also provide services such as distributed generation, storage, and management options. More and more users will generate electricity by themselves in cases where smart grid and family power generation systems are cost-effective. Responding to their specific needs and economic signals from the power grid, these users will choose to sell, buy, or store electricity.

Given current conditions and global trends, the best solution for electricity involves a mix of centralized and distributed renewable energy.

TRANSPORTATION

Transport and industry are the forms of social activity in which energy plays the most prominent role. Excessive dependence on oil cannot be eliminated, and so we have no choice but to design and use transportation based on oil in innovative ways. The following developments would generate significant energy savings in the transportation field:

- Innovative design and manufacturing can provide solutions that will allow us to fabricate lighter and stronger cars, reduce air and road surface resistance, and avoid the loss of the energy from the fuel tank to the wheels.

- In addition to focusing on better public transport, we need also to focus on building better modes of social interaction when considering alternative transportation solutions. For example, online ordering can reduce the need for trips. In general, better-designed communities will require fewer, as well as faster and shorter, modes of travel for residents.
- Clean energy will drive our vehicles. Electricity, hydrogen, natural gas, and advanced bio-fuels offer plenty of options. Although aircraft, heavy trucks, and ships cannot achieve cost-effective electric drives, bio-fuel can be a substitute for oil.

INDUSTRY

If vehicle power comes from hydrogen and electricity in a 50-50 split, requirements for energy processing will be reduced, but further reductions can be achieved by industry if the following changes are made:

- The required energy for basic operations as well as losses in energy distribution systems can be reduced.
- Fuel can be de-carbonized via two options—one is more and more renewable power, and the other is solar energy offering industrial heat.
- Waste can be recycled. We should eliminate the existing bias that favors the extraction of raw materials from the earth over the use of recycled materials, and make use of various forms of cogeneration.

BUILDINGS

As standards of living increase, energy consumption in buildings is rising due to uses connected to heating, hot water, refrigeration, lighting, and electronic equipment. In

In the future, buildings will be hubs of energy production and storage as well as consumption.

the future, buildings will be hubs of energy production and storage as well as consumption. Intelligent buildings may be able to produce and store electricity, and their physical properties will change according to the weather and a wide range of energy

supply and demand factors. We will need an interdisciplinary perspective and innovative spirit to solve the problem of low energy efficiency in buildings, such as using new materials for high-performance thermal insulation construction. We can make full use of solar energy through micro-grids to generate electricity and heating. All roof, façade, and window space can be used for solar power generation. Finally, the way that residents use buildings will have to change. The Internet of Things can be applied to

strengthen communication between people and buildings, and the energy consumption of buildings can be analyzed through information technology.

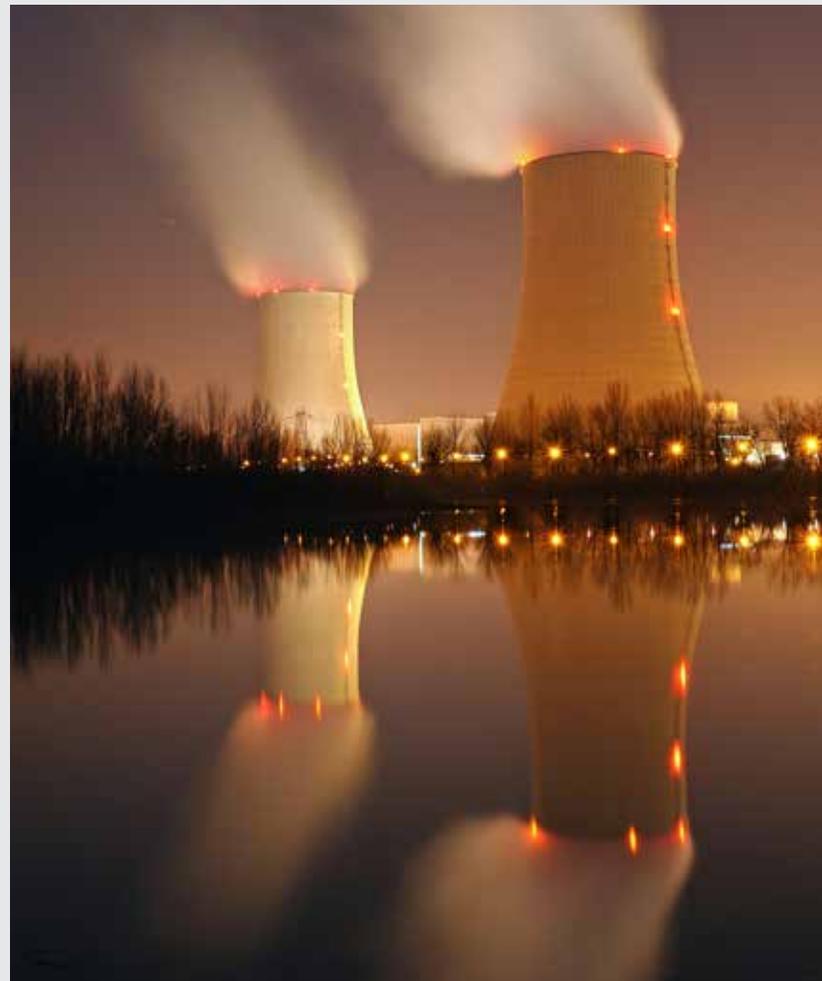
ENERGY REVOLUTION IN CHINA

According to a 2015 article in the *Journal of the Beijing Institute of Technology*, China's per capita power generation for 2014 was 4,200 kilowatt-hours, less than half that of the world's developed countries. In the long term, energy demand will increase gradually. For China, the energy revolution means building a modern Chinese energy system.

Distinctive features of the energy revolution in China:

- Coal is still the main resource.
- China is still at the stage of accelerated development of industrialization and urbanization.
- Due to climate change concerns, the international community has recently proposed new requirements for renewable energy and green development.

Therefore, the energy revolution in China is complex. Green energy, electricity, and oil and gas revolutions are being carried out simultaneously. By the end of 2014, China's installed electricity capacity exceeded 1,300 gigawatts (GW). In that portfolio, the installed capacity of coal power, hydropower, wind power, photovoltaic power, nuclear power, and biomass power accounted for 66.4, 22.4, 6.7, 2.2, 1.5, and 0.8 percent, respectively. We can expect the installed electricity capacity of China to reach 3,000 GW in 2030. In that portfolio, we prefer for nuclear power combined with hydropower to provide 1,000 GW for base load requirements; wind power and solar power together to account for 1,000 GW; and coal power and oil and gas power together to generate 1,000 GW (with half of that total going to meet base load requirements). So climate concerns will be substantially addressed as China's energy structure is reformed and coal consumption is reduced.



NUCLEAR POWER IS INDISPENSABLE IN CHINA

China's southeast coastal area is poor in fossil fuels, but it is the center of Chinese economic activity and energy consumption. The regional mismatch between power demands and supply, together with the pressure of carbon emissions reduction, will make large-scale advanced nuclear power the right choice for China's southeast coastal area. The highest levels of the Chinese government have committed to a policy of constructing third-generation reactors, such as CAP1000 and CAP1400, as the country's main nuclear power plants in the future. This initiative will be guided by the principles of safety first and quality first.

However, no matter what types of reactor are chosen, in order to achieve a large expansion of nuclear power, four critical problems must be overcome. First, nuclear safety and public security should accommodate social development. Second, the economics should be competitive compared to other energy sources. Third, radioactive waste should be minimized. Fourth, proliferation should be under control.

CAP1400 based on Westinghouse's AP1000 technology is able to meet most of the above-mentioned requirements. Some of CAP1400's main technical specifications and performance features include:

While developed countries are progressing in the larger and more various power applications, we shouldn't forget that 1.4 billion people still live without electricity.

- A passive safety concept with advanced nuclear safety standards
- A standardized design for each type to expedite licensing, reduce capital costs, reduce construction time, and simplify site condition requirements
- A simpler and more robust design, making them easier to operate and less vulnerable to operational upsets
- Higher availability (about 93 percent) and operating life extended to 60 years
- Further reduced possibility of core melt accidents and large radioactivity release frequency
- A substantial grace period, with no need for operator action within 72 hours
- Resistance to serious damage from a commercial aircraft crash

- Higher burn-up to use fuel more efficiently and reduce the amount of waste
- Daily load following and frequency response capability for most of the core's lifetime

China's nuclear power equipment manufacturing industry realized a leapfrog development over the last 40 years. Today, China possesses world-class equipment and could produce 12–15 GW nuclear power main equipment annually to meet the needs of China's nuclear power development.

After seven years of development, the CAP1400 qualified supplier chain covering mechanical, electrical, materials, design, and construction is basically established. Eighty-eight Chinese companies have obtained qualified supplier qualification, and design analysis and test verification capabilities have been significantly improved. Eighty-five percent of CAP1400 equipment and materials—including reactor pressure vessels, steam generators, reactor internals, control rod drive mechanisms, main pipes, main pumps and steam turbines, and pumps and valves—can be locally produced.

CONCLUSION

The solution to our energy concerns depends on the context and on how you define the problem. The idea of a set of measures that can be applied to all states is not feasible. While developed countries are progressing in the larger and more various power applications, we shouldn't forget that 1.4 billion people still live without electricity. Although a huge gap exists for energy solutions in different countries, every energy solution will be helpful as long as we guarantee the quality.



Gregory Watson



Andrew Watson

The role of customers in the design process is changing before our eyes. The evolution of “customer centricity” is bound to have far-ranging implications for the quality community. Gregory Watson, a leading global voice on quality, and Andrew Watson, an artist and educator, provide a compelling look at the history of customers and design and the way forward for organizations that wish to remain at the cutting edge of product development and market success.

THE FUTURE OF CUSTOMER EXPERIENCE (CE_x): CE_x Becomes the Dominant Design Force Influencing Markets

Over the past half-century two transformations have changed the way products and services are developed—the first relates to a transition in the way customers are engaged in the process of design, while the second deals with changes inherent to the design process itself. These transformations will continue to influence the process of gathering market insight and its effect on the design of new products and services. Below, we address the significance of this customer domain shift and identify what will be most important for organizations to do in the future if they wish to design success into the core of their culture and its operating processes for product and service development.

FOCUSING ON CUSTOMER CENTRICITY

Peter F. Drucker framed the purpose of a business as to “create a customer” in his 1954 *The Practice of Management*. Customer centricity and the priority of delivering value to customers are principles that were developed in the 1950s and 1960s in the tradition of Japanese quality management under the thought leadership of Kaoru Ishikawa (1915–1989), Shigeru Mizuno (1910–1984), and Tetsuichi Asaka (1914–2012). Customer



Customer Experience

Superior customer-perceived
quality drives profitability.

—Robert D. Buzzell and Bradley T. Gale

centricity became the focus of Japanese business in the following decades, as the core principles of Japanese quality management evolved to concentrate on understanding the motivations of customers to achieve their satisfaction and create loyalty to commercial brands. This key concept experienced a reverse migration as it returned to the West in the guise of the Japanese total quality management (TQM) movement during the late 1970s and early 1980s, which came into full fruition in the quality-focusing years of the late 1980s. Customer centricity became firmly imprinted in the minds of Western executives when a 1987 Wharton Graduate School study by Robert D. Buzzell and Bradley T. Gale identified it as a critical success factor that enabled development of profitable markets. That study concluded, "Superior customer perceived quality drives profitability." The lesson was learned that the best customers are the ones who are profitable and whose trade is retained, and that consistent delivery of quality, in its broadest sense, is the strongest determinant of loyalty in commercial relationships. Today this perspective is commonly accepted as a fundamental principle.

As the customers' experience with the product or service develops over time, so they will tend to develop trust and confidence with the brand, provided their experience is positive.

Finnish architect and designer Alvar Aalto represents an archetype for simplicity in blending form with function in the design process. He identified the ubiquity of the requirement for quality as a principal design criterion: "If you leave quality out of the product, then the whole design exercise is nonsensical in every discipline." For successful outcomes, organizations must design a quality emphasis that is aligned with insight gained from understanding true customer needs to fulfill their desired experience with a

product or service. A desire for simplicity in design must be balanced against the need to embrace the chaotic uncertainty that occurs across the diversity of customer-centric points of view regarding the utility and value of the experience that is delivered through the product or service received.

BUILDING CONSUMER CONFIDENCE

Successful products and services must appeal to the inherent needs of customers, and as the customers' experience with the product or service develops over time, so they will tend to develop trust and confidence with the brand, provided their experience is positive. While this trust must be earned through experience, it can be destroyed during a single poorly managed customer experience. However, if an enduring trust can be established, then the confidence of customers will increase brand value. Single

experiences can provide gratification of customer desires, i.e., customer satisfaction; but only when these satisfactory events accumulate over time will enduring satisfaction create brand confidence, build customer loyalty, and establish a foundation for expectations of future service that is “fit for continuing attraction.” Such achievement is an outcome that must be “purposefully designed into” the product or service proposition and not be merely a serendipitous possibility left to chance.

The need for earning trust through design creates the second transformation—a shift in responsibility for getting the design right from the customer perspective, and the need to align the deliverable to the customer’s explicit and implicit needs. Designers have fulfilled this responsibility in four differing manners over the past century. The initial model is the one that humans have used for centuries—the craftsman-designer model directly and intimately connects the designer, who is also the engineer and artisan, with the customer, as a custom product is designed in an iterative process of alignment to the customer needs. The design of a sword for a knight in medieval times is a classic example.

The second model evolved out of the possibilities created by the industrial revolution, when products were designed for mass consumption. In this model the designer-engineer is separated in time and space from the customer-user-consumer. The intimate connection to the customer is broken, and the nearest human to the designer-engineer, who serves as the subject of the latter’s trials, is sitting at the next bench in the R&D laboratory. Testing or market research is thus separated from customer experience, creating a gulf that must be bridged.

The third model attempts to do this by designating marketing professionals to solicit input from customers that can then be dispensed to the R&D team for their interpretation. The goal is to create a “killer” application or product that generates runaway excitement with features designed for generic customers based on interpretations made from the far-removed laboratory.

The fourth model is the approach that is currently evolving toward maturity. In this model the customer acts as craftsman and through direct involvement in the design selects how to tailor product or service functionality to satisfy his or her particular, and perhaps unknown or unexpressed and therefore ambiguous, requirement. Through experiments in the process of design, the customer becomes engaged in sequentially creating his or her desired experience with the product.

While this trust must be earned through experience, it can be destroyed during a single poorly managed customer experience.

A transition is thus implied in engaging customers in the process of design:

- an evolution from the **craftsman model** (where the designer interprets customers and experiments to develop the entity delivered based on an intimate knowledge of the product),
- to the **engineering model** (where a technical specification drives the design, but the designer is quarantined from direct observation of customer experience during the design process and totally removed from after-sales observations),
- to the **marketing model** (where researchers ask customers for ideas and input to align customer-perceived needs to the design created by the R&D team),
- to the emerging fourth-generation model, the **customer-driven model** (where the customers select from a menu of available designed functions or features of the product or service that they wish to experience).

The question then shifts to how this menu of potential customer-selectable functions is to be populated with alternative elements for inclusion.

For years, marketers have modeled the process of consumer choice as a decision funnel that narrows or filters alternative choices from multiple purchase options down to the final selection. This model assumes that the process is moving in a linear fashion from awareness to interest to desire and, finally, to purchase. However, the ways that people choose and the psychological approach for making choices are more complex and less linear than the model suggests. In his 2011 best seller, *Thinking, Fast and Slow*, the economist Daniel Kahneman pointed out that only 30 percent of human decisions are governed by rationality while the remainder are the result of emotionally based choices

Customers don't know what they need, and different customers perceive their needs based upon their unique psychological circumstances.

that do not follow logical guidelines. Online discussions about this sales decision funnel by Nicole Kelly and others have indicated that more than half of consumers have a strong idea of which brand they will be buying before they begin to shop. Customers aren't coming into a purchasing decision with a blank slate—purchase decisions are driven by implicit, passive, or *a priori* considerations as well as

by explicit criteria. These *a priori* considerations create bias in the purchasing decision before the choice even enters into the active cognitive domain of the consumer! Thus the rational behavior of markets may not be a sound economic assumption for investigating patterns of consumer behavior or learning—perhaps the chaos theory of Edward Lorenz

and James Glick would be more appropriate. In the future, high-powered analytics processing big data may help create order out of the disorder of human behavior, but there are no guarantees.

IDENTIFYING CUSTOMER REQUIREMENTS

Customers don't know what they need, and different customers perceive their needs based upon their unique psychological circumstances. A customer's point of view is defined by his or her gestalt—a combination of attitudes, cultural influences, and the like. When asked, customers might not be able to accurately capture their own gestalts. In his 1949 *Language in Thought and Action*, Samuel I. Hayakawa (1906–1992) observed that customers tend to mumble when asked about their needs, confusing reports with judgments and inferences. This inability of customers to fully understand and express clearly their need or requirement means that ambiguity will be inherent in the design function—until the customers' consumption of the product or service can be observed directly and in real time. Lack of clear communication obscures genuine customer requirements.

Mindfulness in design attends to the hidden, latent needs that even the customer cannot articulate.

In 1984 Noriaki Kano introduced the theory of attractive quality, which used the psychological theories of Abraham Maslow (1908–1970) and Frederick I. Herzberg (1923–2000) to describe the relationship between design excellence and customer perception of satisfaction with the execution of the design. While this theory has been widely accepted within the community of quality specialists and technical designers, its integration with industrial designers is ongoing. The psychological focus of Kano's theory has strong implications for product and service design because it highlights the need to develop profound knowledge of the customer's utility function. The goal is to develop this understanding to the point where it is reflected in product or service design. Customer intimacy thus means more than comprehension of the physical user experience—it means getting into the minds of the customers to grasp what they will perceive as attractive. Successful design excites customers because it delivers a product or service feature that is "fit for attraction." This requires more than just attention to what designers call the UX or the user experience—it requires intensive, comprehensive learning about the broad spectrum customer experience, designing CEx into technical specifications.

The psychological lens of the Kano theory of attractive quality means that customers make purchase decisions by comparing the design promise of a given product or service with the alternative promises from competing options. Following the purchasing decision, the CEx will demonstrate how well that product actually works with respect to what

Clayton M. Christensen has called “the job that needs to be done”; customers assess how the product or service actually suits their need in an experiential manner, as opposed to the rational-emotional judgment behind the purchase decision. This is the way that knowledge about products and services is gained through execution of the “work” that defines the experience for customers.

Mindfulness in design attends to the hidden, latent needs that even the customer cannot articulate but that he or she will immediately recognize as “fit for love”—the attractive quality that is the innovative state of design in Kano’s theory. This is the same attraction that creates “love at first sight!” Steve Jobs encouraged Apple product designers to seek this state when he recommended that they should “design the buttons so that the customers want to eat them!” Transitioning design thinking from the explicit to the implicit, latent requirement space represents a leap that advances the design process beyond science with its laboratories and places it within the artist’s studio.

INTEGRATING QUALITY INTO DESIGN

Design creates a bridge between the internal perspective of functionality in a desired feature of a product or service and the external use or application of that feature in the domain of the

customer’s experience. Building a design thus requires both technical and artistic capacities. Designers must be able to put themselves in the place of customers to understand their needs and to bridge the gap between the laboratory and the environment in which a service or product will be used. Thus, successful design reflects study of the real-world environment—not just knowledge of engineering and technical functions. Innovative capacity is not the skill that is necessary; innovation is an outcome of the process. Rather, improved design is the need, and improved design requires



improvement of the entire process, not just the engineering and technical functions. Quality design outcomes are generated through inclusion of artistic thinking in the effort to humanize the technology so that it performs well in the hands of the customer.

DESIGNING FOR INDIVIDUALIZED TECHNOLOGY

What will change in the coming decades with respect to the customer experience and the way that organizations respond? An increase in intimate knowledge of customer points of view will stimulate the design of individualized technology, and product architecture will complete the transition from the pre-industrial revolution craftsman model to the mass production of the factory environment. The outcome will be mass customization, i.e., the ability to introduce variety through options in the process. The final stage of this transformation will be reflected in the engagement of customers in design at the point of sales. The possibility of customization of products is already a reality for athletic shoes; Nike and Converse both allow customers to design their own shoes, creating an opportunity for shoe-wearers to choose their shoes' style, color, fabric, treads, etc. This capability involves the customer in the design process and makes the shoe reflect his or her individuality, effectively creating a personal brand.

This capability (of customizing shoes) involves the customer in the design process and makes the shoe reflect his or her individuality, effectively creating a personal brand.

How can an organization design individualized technology that adds value to the customer experience? The traditional areas of competence within product development and industrial design have tended to reflect the science, technology, engineering, and mathematics (STEM) disciplines. Supplementing these inputs with considerations from the humanities, including behavioral economics and the arts, would enable development of products in a more holistic manner. Concepts from the fine arts, studio work processes, and rapid cycles of experimentation and innovation (e.g., agile design in software) could be used to learn more about the user's experience. The goal would be to cultivate empathy—to develop knowledge of the customer's inherent need. For this to occur, developers of new products will need to build their creative confidence.

A recent TED Talk by IDEO founder David Kelley describes the need for building creative confidence by citing the example of Doug Dietz, an engineer at GE Medical. Kelley described the situation as follows:

Dietz creates complex medical imaging equipment, including an MRI machine that is incredibly important to the medical process. But one day, Dietz saw a little girl crying, scared of the treatment she was about to receive. And whereas he'd once been proud of the lives he'd helped save, now he was disappointed to realize the fear the machine caused. And so he turned the machine into an adventure. The results were dramatic: From 80 percent of kids who had previously needed to be sedated, now only 10 percent required anesthetic. Repeating a story that has by now entered GE lore, Kelley recounts Dietz waiting with a mother for her child to come out of a scan. The little girl ran up: "Mommy? Can we go again tomorrow?"

Design thinking can succeed when it is stimulated by empathic understanding of the customer experience, in this case converting a frightening medical procedure into an adventure worth repeating. The enabler for the transformation of this customer experience was insight gained through direct observation of the user, which built Dietz's confidence to design differently.

CONCLUSION

What will organizations need to do to be service leaders in the future? Profound knowledge, rather than profane knowledge, is required. Profane knowledge is subjective and based on cursory or surface-level observations, with extrapolations regarding

Reliability will instead become more broadly defined as performance that customers can count upon and will encompass the total customer experience.

future performance based on assumptions about average performance. On the other hand, profound knowledge is systemic and holistically integrates analytic and behavioral insights to formulate designs that address all aspects of the customer experience. This means that designers of the future will need to develop a more comprehensive and inclusive understanding of the various motivations behind customer requirements, and will need an increased appreciation for the system in which the customer is operating. The challenge is to design customer product or service interactions so that they consistently deliver attractive quality—quality that is worthy of affection. An

important ingredient is empathy with customers, and such intimacy requires moving deeper than a surface-level focus on the end-user experience.

On this journey the process of design will become more social, and customers in their market settings will become the design laboratory of the future. Increasing responsiveness to the customer, now a critical ingredient in agile software design,

will expand into all aspects of the design process, so that reliability will no longer be limited to hardware. Reliability will instead become more broadly defined as performance that customers can count upon and will encompass the total customer experience. To achieve this outcome, innovations will not be the principal requirements; rather, innovations will be the outcome of this work. Thinking differently and designing for humanity will be the actions that are required; humanized technology at the point of use will be accomplished through a process of “mindfully designing,” integrating customer empathy, and artistic thinking. This means that insightful democratic design will be more tightly coupled with reliable engineering execution.

How should educational systems evolve to create this new “opportunity space” in the future? Educational curricula will need to become more integrated as a cross-disciplinary system. This implies a series of transitions in the organization of education from individual disciplines (e.g., engineering, art, business, etc.) to a more interdisciplinary approach (e.g., the current linking of science with technology, engineering, and mathematics in STEM) to a new cross-disciplinary paradigm. The addition of human considerations occurs by adding “art” into the STEM acronym to create STEAM; STEAM is a holistic approach for educating designers of the future. This transition will yield insight into desirable customer-centric attributes by broadening the point of view beyond the generic user experience to ensure that future products and services perform the “job that they need to get done” at a cost that is “worth what the customer paid for it.”

The imperative of strategic planning is to create what IBM calls a “customer-activated enterprise” that welcomes customer influence as a primary, intentional contribution to its business. An enterprise that embeds customer centricity into all aspects of its organization can be sure that an ever-enhanced customer experience will beget continued success in the future.



Ronald Snee



Roger Hoerl

As many of the articles in this volume illustrate, advances in technology and shifting modes of production will impact the role of the quality community within the leading organizations of the next decade. Ronald Snee, an expert in Six Sigma, and Roger Hoerl, a professor of mathematics at Union College, describe how the “century of quality” and job creation can be achieved through, among other advances, addressing the inevitable role of human variation in innovation.

THE FUTURE OF QUALITY: Getting Better All the Time

Quality improvement has been important to humankind since the age of primitive food gatherers. One of our former employers, the DuPont Company, was founded in 1802 to produce high-quality black powder, as the black powder available in the United States was of very poor quality at that time. Guides at the Hagley Museum in Wilmington, Delaware, the site of DuPont’s original powder mill on the Brandywine River, explain that one of DuPont’s advantages was development of a device to measure the explosive charge of gunpowder in manufacturing, which enabled reduction in variation below that of competitors.

Many such examples of the need for quality improvement can be cited and will continue to arise in the 21st century as customers increasingly demand quality products and services. Organizations using Lean Six Sigma have made great strides over the last 20 years through quality improvements that have enhanced organizational health and added billions of dollars to the bottom line. Quality pioneer Joseph M. Juran predicted that the 21st century would be the “century of quality.”

What is next on the horizon? Predicting the future is a risky business. Yogi Berra admonishes us, “It is tough to make predictions, particularly about the future.” A fruitful way to proceed is to identify the unmet needs and opportunities and then discuss solution strategies and approaches. There are many unmet needs today including quality healthcare and education at a lower cost, better government services at lower costs at all levels, and improved performance of nonprofit organizations. Job creation is of particular importance in the United States, where middle-class jobs are disappearing due to



Getting Better

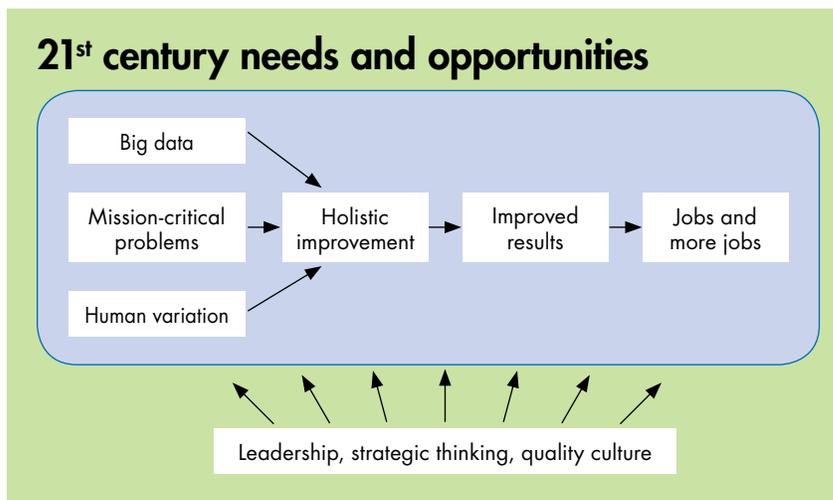
Big problems and issues are all associated with big opportunities, and a quality focus can provide critical guidance to exploit them.

automation and outsourcing to other countries. The pharmaceutical and biotech industries are focusing on using quality by design to speed up product development, improve the quality of manufacturing and services, and meet regulatory requirements at a lower cost. These big problems and issues are all associated with big opportunities, and a quality focus can provide critical guidance to exploit them.

There are five specific advances that we believe are much needed, and that can help organizations improve their performance going forward:

- Apply holistic improvement approaches that include all processes, from services, administration, and R&D to sales, marketing, and manufacturing.
- Focus on identifying and solving mission-critical problems.
- Use big data to solve problems that were previously thought to be beyond solution.
- Learn how to better address human variation.
- Enhance learning regarding how to use innovation to create jobs.

The needs and opportunities of the 21st century are of improvement; hence our sub-title, "Getting Better All the Time." We believe that the five advances noted above (see figure below) will take businesses and organizations of all types a long way toward major improvements and development of competitive advantage. This view will enable management to think broadly about the continual improvement opportunities in their organization. We will discuss each of these needs and opportunities in some detail and show how a quality focus can produce advances.



HOLISTIC IMPROVEMENT

The approaches we use to design, control, and improve our products, processes, and services have evolved over the last 100 years or so. Today we are recognizing more and more that organizations are systems, and a systems view is needed to create significant and lasting improvements. In 1964 Peter Drucker pointed out

that “only the overall review of the entire business as an economic system can give real knowledge,” and a decade ago our colleague Gregory Watson (see “The Future of Customer Experience,” pp. 54–63) discussed how a business systems engineering approach could be applied to business improvement. As we have written more recently, the holistic improvement approach views an organization or business as a system that can be improved at any location around the world, in any culture, in any business function. Accordingly, a focus on holistic improvement moves improvement well beyond the factory floor. No one technique or methodology is universally best for all problems, despite the frequent fads and bandwagons that arise.

SOLVING MISSION-CRITICAL PROBLEMS

Lean Six Sigma as currently practiced tends to miss the large, mission-critical problems that an organization faces. These problems are typically large, complex, and unstructured—too big to be solved by one Lean Six Sigma project. For a variety of reasons, including fear of failure, management may overlook them in favor of lower-hanging fruit, where success is almost guaranteed. But success in a series of minor projects does not bring the breakthrough improvements that senior leadership expects. In our view, this was one of the limitations of total quality management as practiced in many organizations.

The good news is that large, complex, unstructured problems are exactly the type of problems that the statistical engineering approach was designed to handle.

The good news is that large, complex, unstructured problems are exactly the type of problems that the statistical engineering approach was designed to handle. Two examples of such problems include a fill weight targeting system for a large corporation with hundreds of products and NASA’s system for planetary entry, descent, and landing. Statistical engineering’s five building blocks for such problems are problem identification, creation of structure, understanding the context of the problem, development of an overall strategy, and creation of tactics.

USING BIG DATA TO GENERATE NEW KNOWLEDGE

Data mining has been in vogue for the last 15–20 years. Around 2005 the trend picked up steam with the advent of “big data,” fueled by the ubiquitous availability of the Internet and IT hardware and software. We are now talking about terabytes and petabytes of data. We also have software such as SAS, R, Hadoop, Python, and JMP that can help us “tame” big data. The big data focus, as with all new developments, is a good news/bad news situation.

Big data offers the opportunity for quality professionals and others to solve problems previously thought to be unsolvable. While much progress has been made in medical research and Internet marketing, one area overlooked to date is the design and improvement of products, services, and process quality. Customer surveys can help us better understand

customer needs and experiences. Collection of manufacturing data and integrating it with customer data can help improve products and processes. This is the good news.

On the other hand, many have adopted a philosophy of: big data + fancy algorithms = great results. If things were only so easy. First we are reminded that the data of big data studies are observational data at best, typically collected without attention to study design and measurement accuracy. It is also important to recall that analyzing observational data requires a great deal of detective work to find those critical variables that are producing the majority of the variation in the system. In many situations the main contribution of analysis of a set of big data is the identification of theories and hypotheses to be evaluated in a series of future studies.

The popular view that big data will provide all the answers to a given problem unfortunately ignores what has been learned over the years regarding problem-solving fundamentals. As Tim Harford has written, even in the era of big data, problem solving still requires attention to:

- The sequential nature of problem solving, as studies are rarely completed with a single data set but typically require the sequential analysis of several data sets over time
- Strategic thinking, which is needed to identify the strategy that will be used to execute the project and conduct the data analysis
- Data pedigree, which must be assessed to determine the value of the data for solving the problem, the quality of the data, and how the data will be analyzed. Statistically designed surveys and experiments are still needed to generate quality data.
- Subject matter knowledge, which should be used to help define the problem, assess the data pedigree, guide analysis, and interpret the results

These fundamentals are all part of the statistical engineering philosophy and methodology. As big data are frequently associated with large, complex, and unstructured problems, the statistical engineering approach provides concepts, methods, and tools to deal with them.

HUMAN VARIATION

Recent world disasters make it clear that improvement initiatives need to pay closer attention to human error, which is better characterized as “human variation.” Humans are arguably the largest source of variation on the face of the planet. Airplane crashes, train derailments, chemical plant explosions and the like continue to happen, even when we know how to prevent them. Unfortunately, knowledgeable humans don’t always do what they have the knowledge to do.

Our improvement strategies and Lean Six Sigma methodologies must do a better job of dealing with human variation. Sometimes the solutions are simple and easy to implement.

In a 2010 book, Atul Gawande showed how effective checklists are in reducing surgery infection. More generally, checklists, when used properly, can be very effective in reducing human variation. Mistake proofing and visual management are other useful tools.

Short timelines, fear of failure, and inadequate budgets that flow directly from management can result in products and process that do not take human variation into account. One opportunity to redress this situation is to use the concepts, methods, and tools of robustness, as described by the Japanese quality pioneer Genichi Taguchi and his co-author Yui Wu. In this way we can create products, manufacturing processes, and human work processes that are robust to sources of human variation, including:

- User-friendly IT and software that are robust to lack of computer literacy
- Home-use medical instruments
- Pharmaceutical tablet design that minimizes patient medication errors
- Auto bumpers that are not damaged by low-speed collisions

Human variation will always be with us. Problems will continue to arise. Improvement professionals need to do more to mitigate this variation by creating products and processes that perform well even in the face of a lack of human attention, experience, or expertise.

CONCLUSION

We noted at the outset that one of the big problems, particularly in the United States and perhaps in other Western countries, is the loss of middle-class jobs to automation and lower-cost labor abroad. This trend will continue. Quality improvement defined as innovation has a major role to play here to create a win-win where all countries can benefit.

As Deming pointed out many years ago, quality improvement leads to more jobs. Deming's chain reaction starts with quality improvement innovation, which produces lower costs and higher productivity, which begets an increase in market share, which in turn leads to staying in business and producing more jobs. Innovative quality improvement can also protect existing jobs by creating new technology and designing products and processes that reduce material and labor costs. Economic opportunity is increased, and the standard of living, particularly for the middle class, is enhanced in the process. As Deming pointed out, no nation need be poor.

The work goes on to improve quality just as it has for decades, even centuries. There are and will continue to be big problems to solve and opportunities to be seized, all with high risks and large benefits associated. Strategic thinking and leadership focus on quality culture are needed more than ever before. The future is certainly bright for the quality profession and others engaged in producing quality products, services, and organizations. Individual action and change is required to capitalize on the opportunities; no one said it would be easy!



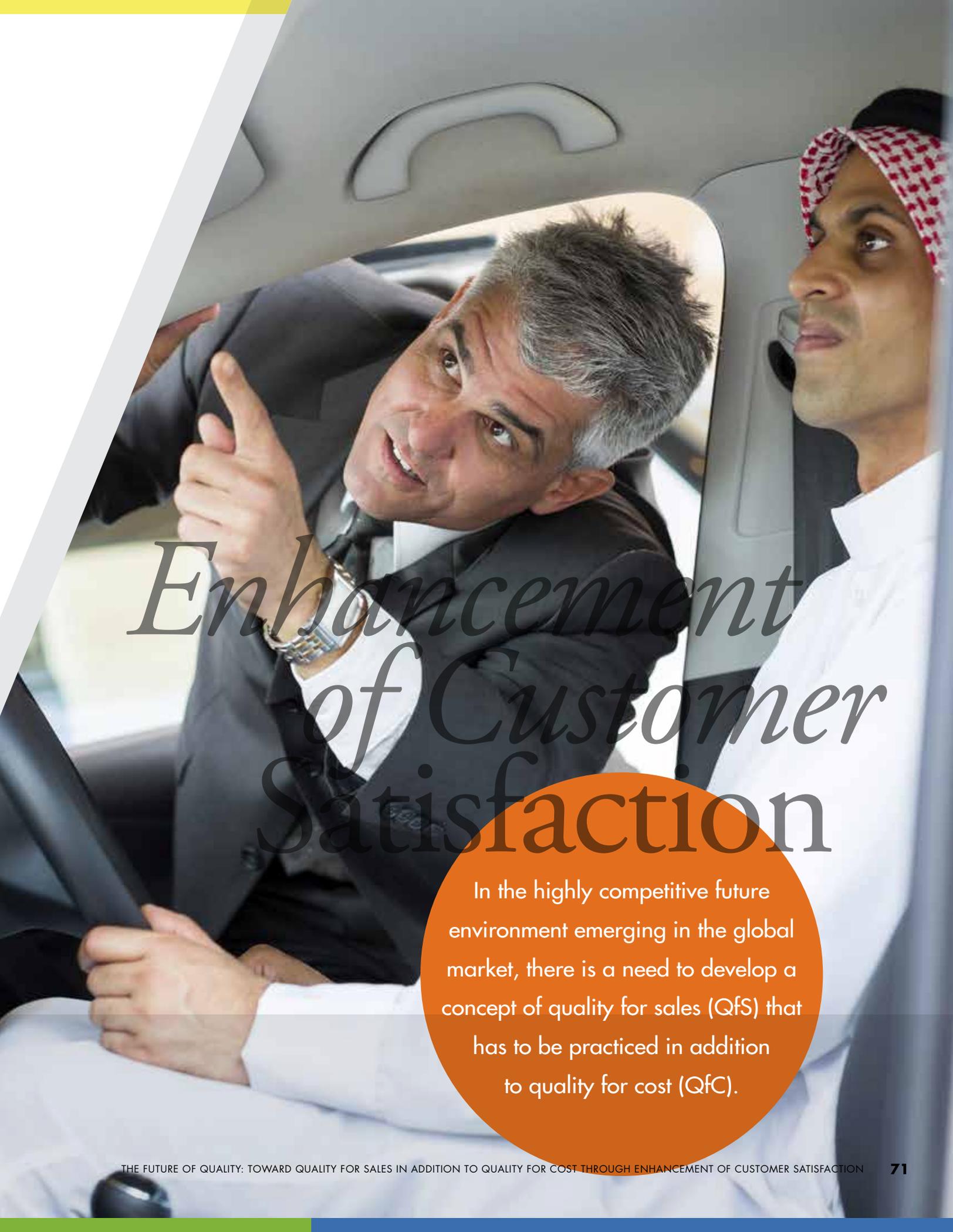
Noriaki Kano

In this piece, Noriaki Kano, professor emeritus at the Tokyo University of Science and a leading global expert on quality, draws on a wealth of experience and knowledge to share a view of quality's future informed by the inclusion of quality for sales. Dr. Kano's over half a century of experience has featured countless contributions to the pursuit of quality, including the development of the Kano customer satisfaction model. He has also been honored with three ASQ Medals of Distinction and has been elected an Honorary member of ASQ.

THE FUTURE OF QUALITY: Toward Quality for Sales in Addition to Quality for Cost Through Enhancement of Customer Satisfaction

Needless to say, the objective of quality management is to enhance customer satisfaction, which in turn has considerable impact on the financial results of the organization. Customer satisfaction in turn is impacted by quality for cost (QfC); quality management has thus far focused efforts in this realm primarily on paying out warranty claims, recalling products, and guarding against the repetition of past failures in new products. However, in the highly competitive future environment emerging in the global market, there is a need to develop a concept of quality for sales (QfS) that has to be practiced in addition to QfC.

To begin with, what are we talking about when we talk about sales? At the simplest level, sales is a function of demand (D), coverage (C), and success rate (SR), where



Enhancement of Customer Satisfaction

In the highly competitive future environment emerging in the global market, there is a need to develop a concept of quality for sales (QfS) that has to be practiced in addition to quality for cost (QfC).

D is the total population of potential customers who might desire the product, C is the subset of that population reached by marketing, and SR is then the subset of customers reached by marketing who actually make a purchase. Thus, SR/D is an equation for market share (MS), and unrealized sales, representing both potential customers unreached by marketing and reached customers failing to purchase the product, can be expressed as $(1 - MS)$, where the universe of all potential customers is normalized to 1. Conversely, realized sales can be understood as $(D * MS)$, and MS can be expressed as $(C/D * SR)$. This is visualized in Figure 1.

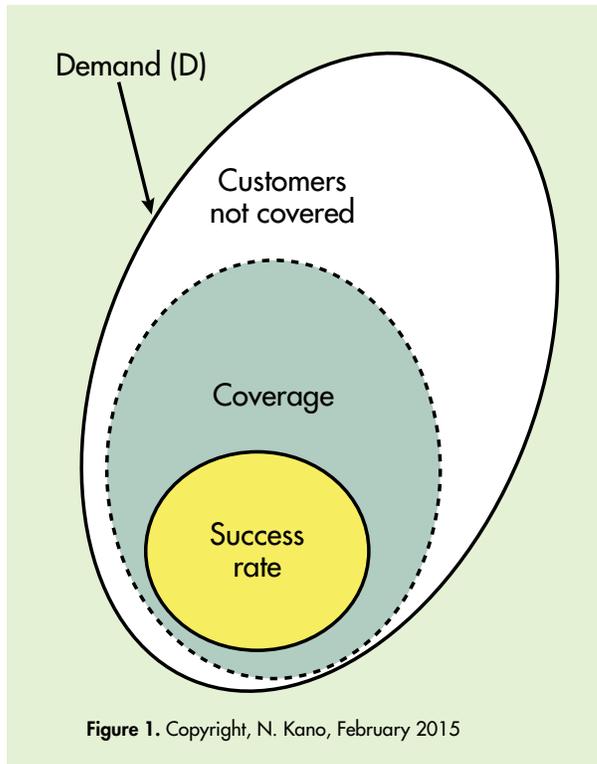


Figure 1. Copyright, N. Kano, February 2015

Of course, many of these factors are impacted by variables outside the realm of quality. Marketing efficacy and brand strength are the largest determinants of how many customers one reaches (C), for example, and a customer's initial selection of a specific brand among alternatives (SR) is likely to be shaped by the product's price and payment conditions (P&PC) and delivery (Del) options, among other factors.

The nature of sales as an output resulting from many inputs is visualized in Figure 2 (on p. 73).

That being said, however, quality still plays a critical role in the overall process of sales. For illustrative purposes, let us consider the particular case of replacement purchases, where customers seek to replace aging semi-durable products such as refrigerators, cars, or keyboards. In this case, we might divide the question of quality into "past quality" (Q1), or what the customer has experienced thus far of the quality of current product, "present quality" (Q2), or how attractive the customer currently finds the product relative to its competitors, and "future quality" (Q3), or how the customer expects a product to safely and reliably serve him or her as time elapses under expected or unexpected usage conditions.

As an example of how these different aspects of quality interact, we might consider a driver who has used a car from a particular brand for the past five years, and is now looking to replace it. In this case, the three Qs would be as follows:

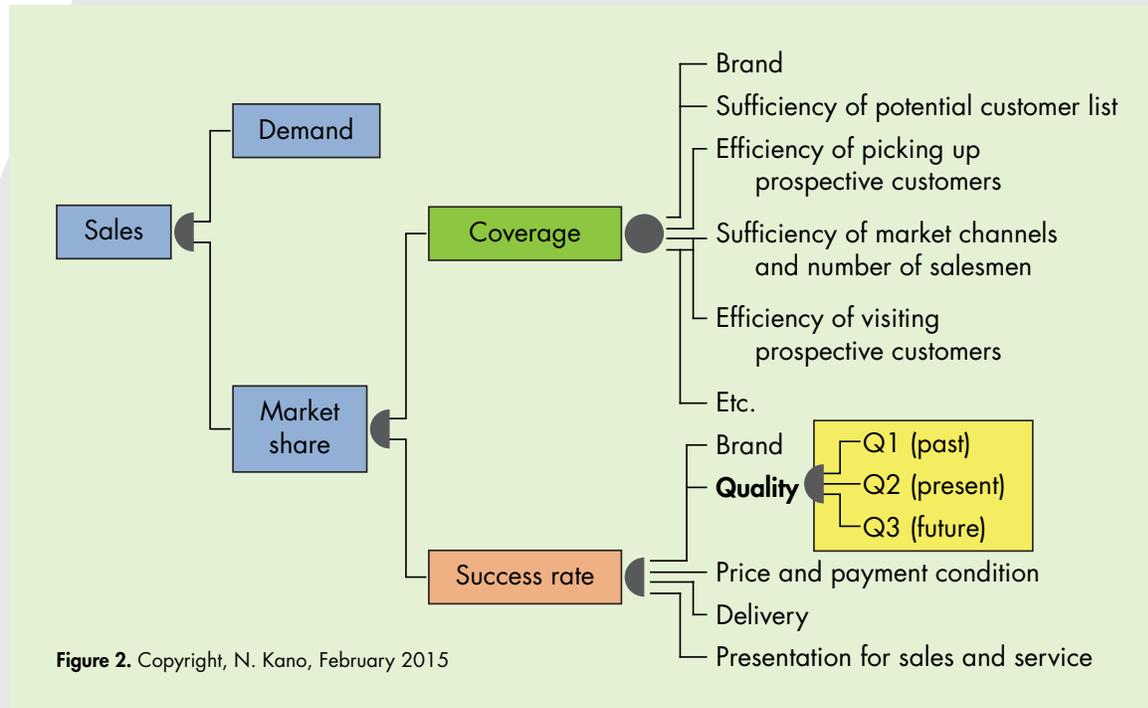


Figure 2. Copyright, N. Kano, February 2015

- Q1: The customer, having driven the car around for half a decade, is either content or unhappy, having experienced between zero and many problems with the vehicle.
- Q2: A competing brand offers a new model, and the customer either finds said brand more attractive than the new model of his or her current brand, or vice versa.
- Q3: This is a quality of a product that may change after lapse of time in use under expected or unexpected conditions and is expected by the customer at the time of purchase. Safety and reliability are typical examples of Q3.

In the above case, assuming that the customer selects a brand only based on quality, even if the customer has a positive Q1, curiosity might still drive him or her to choose a competitor

due to superior Q2. Conversely, even if the customer has a negative Q1, risk aversion might still lead him or her to stay with the brand.

For a car maker, the issue of greatest concern is when a customer who currently uses the brand's car decides between replacing it with the brand's new car or switching to a competitor's model. In this case, the factors that influence the selection of brand will in general depend on these Q1, Q2, and Q3, as well as other factors of product power as discussed above.

Let us now generalize our discussion of the three Qs.

What is Q1? Q1 is the customer's impression of the current car, which can be further subdivided into Q1a, Q1b, and Q1c:

- Q1a: The customer's perception of treatment received during the warranty period when compensation claims are filed, in terms of responsiveness and degree of resolution.
- Q1b: The customer's perception of problems not covered under warranty, or problems leading to inconvenience and discomfort due to inappropriate design specifications, such as poor air conditioning or difficult-to-read signs in small lettering on the dashboard. These are problems that cannot be solved by repair, rework, or reform. In addition, there could be minor problems the customer thinks are not worth filing claims for.



- Q1c: The customer perception of the product overall in terms of likes and dislikes, as dependent on the strengths and weaknesses of the product in usage, the provision of good or bad service, or the provision of appropriate or inappropriate information to the customer after purchase. Style belongs in this category.

Importantly, however, how one approaches the three Qs differs depending on whether one adopts a QfC or QfS framework.

Among the subdivided category, Q1a covers warranty claims that obviously lead to extra cost and hence lower profitability for the manufacturer. If the cost is benchmarked against

that of competitors, it will motivate the manufacturer to focus on Q1a to enhance profit and control cost. For this purpose, cost is analyzed on the basis of problems as they occur in the relevant phases of production, with measures to prevent recurrence being widely investigated. In this context, Q1a can be thought of as a typical example of QfC. In addition, Q1a influences the buyer's replacement purchase decision. Therefore, Q1a also falls under QfS.

On the other hand, the manufacturer does not incur any cost at all for Q1b and Q1c. However, the manufacturer will be rewarded or punished by the consumer's purchase decision based on both Q1b and Q1c, and thus these both fall under QfS.

What is Q2? New models with specialized attractive features may be released by various brands as replacement options for the customer. For example, in the case of a car, automated driving is considered one of the hot features today. Evaluation of such features by customers falls under Q2 and influences brand selection. Therefore, Q2 is QfS. Fashion should be considered a very important factor by the manufacturer when offering new features. This is especially the case in B to C, relative to B to B.

Management might seek to orient the development of said new features. For example, instructions could be given to focus on: high-tech features, stylishness, or a reasonable operating cost, among others.

In order to realize these developments, there are two approaches:

- Find an application for an already-developed technology.
- Explore customer needs through a customer usage survey, and then find appropriate technology to fill them.

While the former approach has been the dominant method for a long time, the latter approach will become more important for matured products. One way to revitalize sales of these goods would be to implement attractive quality creation, as based on the Kano model's attractive quality theory as linked with the Yoneyama model. (For more on the Yoneyama model, the reader is encouraged to visit <http://www.juse.or.jp/english/archives/#anc01>.)

An illustrative example: In July 2006, Indian company Mahindra and Mahindra (M&M) launched the "Shaan" farm tractor, a multipurpose vehicle useful not only for agriculture, but also for transporting goods, people, and the family. M&M realized that customers were not just using their products for farming, and thus added to their new tractor model a built-in trolley, higher road speed, and a soft-top canopy. These initiatives assisted M&M with becoming the world's largest seller of tractors in 2009.

Finally, what is Q3? Q3 is dependent on future issues, and represents the consumer's confidence about the safety and reliability of the product, including the risk of critical accident or failure related to newly introduced features.

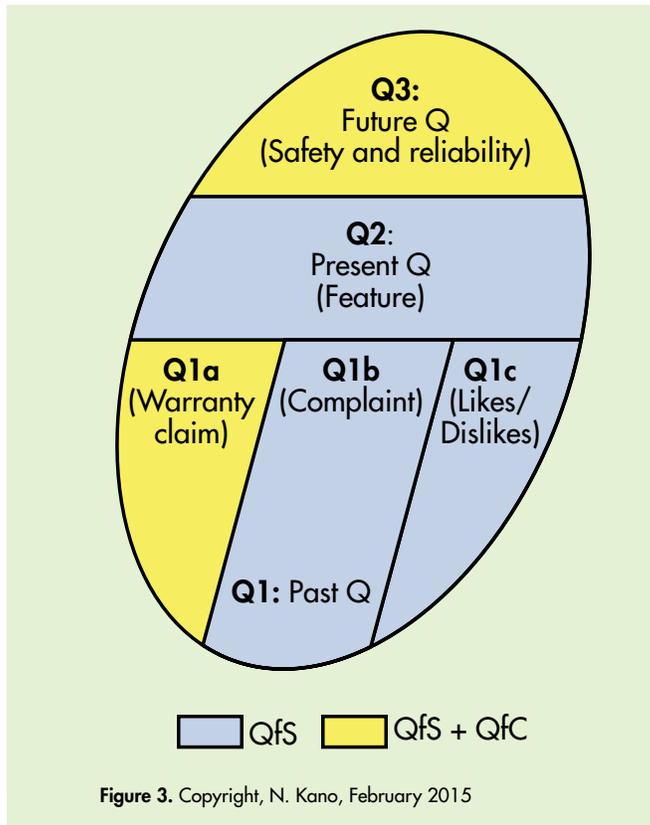


Figure 3. Copyright, N. Kano, February 2015

Working in Q3 thus involves instilling conviction in the customer that the product is safe and reliable, including through systematic activities such as failure mode and effects analysis (FMEA). There is no doubt that when a customer purchases a product, especially a safety-related one, that this confidence is an important key factor for brand selection. Therefore, this is a factor that falls under QfS. If an accident or failure happens or occurs in usage, however, it becomes Q1a for the purchased car as a factor under QfC. In addition, Q3 also includes the trends of governmental regulation or insurance in case accidents happen or occur. It is affected by brand too.

Another example is illustrative: The personal information protection law was established in Japan in May 2003. Executives who bring back documents that contain personal information were sensitive to this issue. For shredder makers, this was a business opportunity, and a shredder was developed for family use.

This was only a downsized version of the office-use machine, and the opening slit for feeding the paper was kept the same. Sales steadily increased and this penetration into a new segment seemed to be very successful. However, on March 10 and July 15, 2005, two infant children lost their fingers. (For more on this case, the reader is encouraged to see the news release by the Ministry of Economic, Trade and Industry, at <http://www.pref.miyagi.jp/uploaded/attachment/7256.pdf>)

Finally, see Figure 3 for a visualization of the three Qs.

One more question remains: How important are these aspects of quality, relative to each other? As Q3 is evaluated after a probable brand is proposed, we might regard our comparison as strictly being between Q1 and Q2. In truth, however, this question lacks a single answer, as the relative weight of Q1 and Q2 is likely to differ by customer. Even for the same person, Q1 and Q2 may possess differing levels of importance for different products.

That being said, however, we might generally say that young people, in particular, tend to select trendy features and thus place a higher priority on Q2, while those who are older are likely to exhibit relatively conservative purchasing behavior, and thus prioritize Q1.

As discussed above, the area of quality activities should be expanded to QfS in addition to QfC, which is already the responsibility of quality professionals. It is not realistic to expect that all activities will be their responsibility; however, quite a wide area can be covered by them. In this case, we should start preparing for the new challenge.

Acknowledgment: The author is indebted to Janak Mehta, chair, International Academy for Quality, for his involvement in discussion that was very helpful to polish the concept of Q3.



Cecilia Kimberlin, Ph.D.

CONCLUSION: Quality for the Future

As I look back over more than 30 years of experience in healthcare and medical products, I am confident of a future where quality will be even more essential and impactful to the global economic and social environments. What observations and experiences as a quality leader and executive support this optimistic view?

Quality is essential to brand development and loyalty. We know of examples where innovative products that lacked quality were not successfully sustained. In an age of instantaneous public media, quality issues have sent stock prices spiraling downward. Organizations, whether public or private, for-profit or not-for-profit, have lost credibility with stakeholders and brand loyalty when they have failed to deliver quality. Annual reports often cite quality issues as future risks and reasons for poor performance.

To consistently achieve successful outcomes, quality must be an organizational mindset—not a set of policies, rules, and tools governed by the quality function. When quality is integrated into the way we do business—finance, marketing, design, development, operations, supply chain, customer interactions—we experience the benefits of all that

When quality is fundamental it is integrated as an organizational philosophy that supports and enables innovation, growth, positive customer experience, and talent development.

quality promises: customers who loyally promote us; elimination of waste, saving time and money; a reliable, cost-competitive supply chain; profitability; a positive organizational reputation; and trusted brands. When quality is fundamental to the organization's culture, from the CEO or organizational leader to the frontline employee or member,

it is integrated as an organizational philosophy that supports and enables innovation, growth, positive customer experience, and talent development. Quality is fundamental to sustainable business and organizational success.



Future Quality

Quality is essential to
brand development and loyalty.

There are also examples when an organization is not successful because quality is limited, positioned as a program, a function, a set of tools, or a reactive failure management system. In these situations, innovation suffers; bureaucracy and complexity grow; people are not empowered and have little ownership of the underlying issues.

Let's turn to the future. What will the future bring that enlivens and challenges our current thinking and practices of quality? What factors impact the way we will lead quality in the future?

Change is accelerating at an unprecedented pace. Technologies are advancing, and our familiar frameworks are more quickly obsolescing. Innovation is key. Access to data and media is evolving, with the amount of data becoming overwhelming to analyze, making it harder to distinguish relevant information for knowledge and timely decision making. The globe is continually shrinking. More and more organizations will be "global" directly through their own markets, or indirectly, because of global and regional supply chains. Evolving and potentially destabilizing social and economic factors, from exchange rates and natural resources to politics and demographics, are becoming harder to predict.

The role of quality professionals will evolve so that they are partners, collaborators, and leaders, not only technical specialists.

HOW DO THESE FACTORS AFFECT THE QUALITY OF THE FUTURE?

Tomorrow's organizations need leaders who embrace quality as an enabler for success. Leaders at every level, in every function, will lead more successfully if they imbed quality into their thinking, analytics, strategies, planning, and execution. In the future, the leadership of quality is shared. The role of quality professionals will evolve so that they are partners, collaborators, and leaders, not only technical specialists. They must lead and serve at every level regardless of title by providing their best insights, guidance, practices, and innovative solutions for achieving quality outcomes.

The approaches, skills, and tools of the past may not be sufficient. They may actually stifle future organizational ability to drive innovation, leverage real-time information and "big data" analytics, design quality into innovative products and processes, remain agile, adapt new technologies and materials, and redefine understanding of unmet needs and how to meet them.

To prepare for this challenging and exciting future, change is needed in how we develop quality professionals and how quality is integrated into professional development overall. Professional societies like ASQ must change as well. ASQ's mission is to increase the

use and impact of quality. To fulfill this mission in the future, new partnerships and collaborations with businesses, business schools, and academia, other professional societies, industry groups, and government agencies are needed. ASQ must support quality professionals to strengthen capabilities and broaden skills in business acumen and organizational excellence while innovating and updating our body of knowledge and quality tools.

An equally exciting opportunity will come with other professionals by broadening their understanding of quality and its relevance to organizational success. Imagine interactive and shared learning about quality occurring throughout education in science, technology, business, social enterprise, and leadership development—collectively becoming more knowledgeable and capable about how to deliver quality outcomes. Creating new knowledge networks and interfaces will contribute to novel solutions and applications. Two areas in particular are rapidly advancing toward these goals: the first is the integration of innovation and quality to more quickly allow innovations to become operational; and the second is the integration of quality and social responsibility to foster a more holistic approach to quality outcomes.



What is quality for the future? Imagine a future where quality is an essential connector—a framework and network—for developing and advancing capabilities to create a better world and society.

Cecilia Kimberlin

Cecilia Kimberlin
2015 Chair, ASQ

BE SURE TO VISIT futureofquality.org

Author Biographies

RODNEY EVANS is chief innovation officer of McChrystal Group, where she leads the CrossLead Lab, the firm's research and development team. The lab's mission is to underpin operator experience with academic rigor and thought leadership. Evans and her team innovate solutions to enable adaptability in humans and systems. A pioneer in the talent space, Evans has overseen the invention and implementation of new philosophies and solutions in complex, global organizations. Prior to joining McChrystal Group, she had 15 years of experience in consulting, human-capital management, and organizational development. Evans specializes in change theory, social dynamics, talent strategy, and leadership coaching. She draws her expertise from her extensive experiences with high-level clients in various roles at KPMG Consulting, Deutsche Bank, and as principal of her own consultancy.

GENERAL STANLEY MCCHRISTAL (RET.) was called "one of America's greatest warriors" by Secretary of Defense Robert Gates. General McChrystal co-founded McChrystal Group in January 2011 to deliver innovative leadership solutions to U.S. businesses in order to help them transform and succeed in challenging, dynamic environments. He brings a unique background of honing latent talent in organizations, as well as leading cultural change. A retired four-star general, he is the former commander of U.S. and International Security Assistance Forces (ISAF) Afghanistan and the former commander of the nation's premier military counterterrorism force, Joint Special Operations Command (JSOC). He is best known for developing and implementing the current counterinsurgency strategy in Afghanistan, and for creating a comprehensive counterterrorism organization that revolutionized the interagency operating culture. General McChrystal's memoir, *My Share of the Task*, was a *New York Times* best seller in 2013, and his next book, *Team of Teams: New Rules of Engagement in a Complex World*, is due to be released in May 2015.

JONATHAN ZITTRAIN is the George Bemis professor of law at Harvard Law School and the Harvard Kennedy School of Government, professor of computer science at the Harvard School of Engineering and Applied Sciences, vice dean for library and information resources at the Harvard Law School Library, and co-founder of the Berkman Center for Internet & Society. His research interests include battles for control of digital property and content, cryptography, electronic privacy, the roles of intermediaries within Internet architecture, human computing, and the useful and unobtrusive deployment of technology in education. He performed the first large-scale tests of Internet filtering in China and Saudi Arabia, and as part of the OpenNet Initiative co-edited a series of studies of Internet filtering by national governments. His book, *The Future of the Internet—And How to Stop It*, predicted the end of general-purpose client computing and the corresponding rise of new gatekeepers.

STEPHEN ROSEN is the Beton Michael Kaneb professor of national security and military affairs at Harvard University. He was the civilian assistant to the director, net assessment in the Office of the Secretary of Defense, the director of political-military affairs on the staff of the National Security Council, and a professor in the Strategic Department at the Naval War College. He participated in the President's Commission on Integrated Long Term Strategy, and in the Gulf War Air Power Survey sponsored by the Secretary of the Air Force. He has published articles on ballistic missile defense, the American theory of limited war, and on the strategic implications of the AIDS epidemic. His books include *Winning the Next War: Innovation and the Modern Military* and most recently *War and Human Nature*.

JIM DAVIS is UCLA's vice provost, information technology, and chief academic technology officer—an executive leadership role focused on UCLA's academic research and education mission. Davis has broad oversight of campuswide planning, governance, and strategic investment of IT, manages the Office of Information Technology, and has responsibility for the Institute for Digital Research and Education. Included in his portfolio are UCLA's digital presence, cyberinfrastructure, informatics, policy, mobility, and the Office of the UCLA Chief Privacy Officer. Among the many initiatives Davis is involved with, he currently co-leads a national initiative on smart manufacturing and U.S. manufacturing competitiveness. Davis is also a professor in the Department of Chemical and Biomolecular Engineering at UCLA, where his research interests are in the areas of data analysis, decision support, and intelligent systems.

IZABEL CHRISTINA COTTA MATTE is an architect and urban planner, with a postgraduate diploma in project management from Project Management Institute and a specialization in public management from George Washington University. Cotta Matte has been a civil servant of Porto Alegre City Hall for 22 years—with responsibilities for the implementation of the Porto Alegre Management Model in 2005. Nowadays, she is chief strategic planning and budgeting officer, responsible for managing strategic government programs and special projects. She also leads the planning and budget execution—monitoring the physical and financial implementation of government programs.

DEVI SHETTY, a renowned cardiac surgeon and Indian philanthropist, is chair and founder of Narayana Health. He received his medical degree in general surgery from Kasturba Medical College and subsequently completed specialization training in cardiac surgery at Guy's Hospital in the United Kingdom. Upon returning to India in 1989, Dr. Shetty initially worked at B.M. Birla Hospital in Kolkata, where in 1992 he performed the first neonatal heart surgery in the country on a nine-day-old baby. He later operated on Mother Teresa after she had a heart attack and also served as her personal physician. Shetty has performed more than 15,000 heart operations. In 2001, he founded Narayana Hrudayalaya, now known as Narayana Health, a multispecialty hospital located outside Bangalore. Among other honors, he has been awarded the Padma Bhushan, the third highest civilian award in India for his contributions to the field of affordable healthcare.

JOANN STERNKE considers herself very lucky to be a part of the Pewaukee School District (PSD) since 2001. Under Sternke's tenure, numerous program improvements have been implemented to increase student achievement. Some of these initiatives include a successful 1:1 laptop initiative in elementary through high school, four-year-old kindergarten, advanced high school course offerings with Northwestern University, elementary world language, middle school 5x5 block schedule, and increased high school graduation requirements. In 2010, the PSD was the first education recipient of the Wisconsin Forward Award. In 2013, the district received the Malcolm Baldrige National Quality Award. Sternke was recognized as Wisconsin Superintendent of the Year for 2013.

ZHENG MINGGUANG has a Ph.D. from Shanghai Jiaotong University and is the president of Shanghai Nuclear Engineering Research and Design Institute, chief designer of the large advanced PWR nuclear power plant (NPP), National Science and Technology Major Project, and also an adjunct professor and doctoral supervisor at Shanghai Jiaotong University. Dr. Zheng is an expert in the fields of nuclear reactor technology, instrumentation and control, safety analysis, and NPP simulation. He presently serves as a member of the National Nuclear Safety Expert Committee, National Nuclear Safety Administration (NNSA), a member of the International Committee and the board of directors, American Nuclear Society (ANS), a member of the Technical Working Group on Advanced Technologies for Light Water Reactors (TWG-LWR), International Atomic Energy Agency (IAEA), as well as a member of the Standing Advisory Group on Nuclear Energy (SAGNE) to the director general of the IAEA.

GREGORY WATSON is an industrial engineer and quality consultant. He is past president and Fellow of ASQ and past president and Honorary member of the International Academy for Quality. He has received more than 40 personal quality awards in North America as well as Europe and Asia; and he is the first non-Japanese to have received the W. Edwards Deming Medal from the Union of Japanese Scientists and Engineers. He has been elected Honorary member of national quality organizations in Australia, Argentina, Azerbaijan, Finland, Hungary, Israel, Kazakhstan, Latvia, Russia, Singapore, and the United Kingdom. He is the author of 10 books and more than 300 papers.

ANDREW WATSON is a visual and media artist, educator, and STEAM education policy advisor. He teaches digital art, design, animation, and game design at the Falls Church High School for the Fairfax County Public Schools in Virginia. He volunteers his time regionally as a member of the board of directors of the Northern Virginia Mini Maker Faire and nationally as a founding member of the board of directors of the Innovation Collaborative. He also serves as an advisor to the National Art Honor Society and the Smithsonian Institute's National Portrait Gallery.

RONALD SNEE is founder and president of Snee Associates, LLC, a firm dedicated to the successful implementation of process and organizational improvement initiatives. He was employed at the DuPont Company for 24 years prior to pursuing a consulting career. Snee also serves as adjunct professor in the pharmaceutical graduate programs at Temple University School of Pharmacy and Rutgers University Pharmaceutical Engineering. He received his bachelor's degree from Washington and Jefferson College and master's of science and Ph.D. degrees from Rutgers University. He is an academician in the International Academy for Quality and Fellow of ASQ, American Statistical Association, and American Association for the Advancement of Science. Snee's work has been awarded ASQ's Shewhart and Grant Medals, ASA's Deming Lecture Award, as well as more than 20 other awards and honors. He has co-authored three books with Roger Hoerl on statistical thinking and Six Sigma.

ROGER HOERL is the Brate-Peschel assistant professor of statistics at Union College in Schenectady, NY. Prior to this assignment Hoerl headed the Applied Statistics Lab at GE Global Research, which supports new product and service development across the GE businesses. Dr. Hoerl has been named a Fellow of ASQ and the American Statistical Association, and has been elected to the International Statistical Institute and the International Academy for Quality. He has received the Brumbaugh and Hunter Awards, as well as the Shewhart Medal from ASQ, and the Founders Award from the American Statistical Association. In 2006 he received the Coolidge Fellowship from GE Global Research, honoring one scientist a year from among the four global GE research and development sites for lifetime technical achievement. He used his six-month Coolidge sabbatical to study the global HIV/AIDS pandemic—spending a month traveling through Africa in 2007.

NORIAKI KANO is one of the world's leading experts in the field of quality management. He is the developer of a customer satisfaction model known as the Kano model, which has a simple ranking scheme that distinguishes between essential and differentiating attributes related to concepts of customer quality. He is a professor emeritus at the Tokyo University of Science. Dr. Kano completed his undergraduate and graduate studies in the engineering school of the University of Tokyo. He was the 1997 recipient of the Deming Prize for Individuals, administered by the Union of Japanese Scientists and Engineers (JUSE). In 1997 he also received the Deming Lecturer Award from the American Statistical Association. Kano is an elected Fellow of ASQ and he was the recipient of two ASQ Medals of Distinction—the E. Jack Lancaster Medal in 2002 and the E. L. Grant Medal in 2007.

ABOUT ASQ

ASQ is a global community of people dedicated to quality who share the ideas and tools that make our world work better. With millions of individual and organizational members of the community in 150 countries, ASQ has the reputation and reach to bring together the diverse quality champions who are transforming the world's corporations, organizations, and communities to meet tomorrow's critical challenges. ASQ is headquartered in Milwaukee, Wisconsin, with national service centers in China, India, Mexico, and a regional service center in the United Arab Emirates. Learn more about ASQ's members, mission, technologies, and training at asq.org.

ABOUT LTSG

The Long Term Strategy Group (LTSG) is a multidisciplinary research and consulting firm based in Washington, D.C. The firm's leadership has contributed to the development and execution of many long-range planning efforts in the U.S. government and private sector, including the National Intelligence Council's Global Trends publications. LTSG helps clients diagnose critical threats and opportunities in their competitive environments and develop winning strategies built on enduring strengths. The LTSG team can be reached at inquiries@ltstrategy.com.

FOR MORE RESOURCES, VISIT
futureofquality.org



The Global Voice of Quality™

ITEM B1700



Experts offer
predictions on
the **future of quality**

by Tyler Gaskill, contributing editor

ON THE
Hori

WHAT WILL HAPPEN next? Since 1996, ASQ's Future of Quality reports have gathered the quality community's insight for prognostications on the challenges and opportunities it sees taking shape. While previous reports' forecasts were developed with participation of large numbers of quality professionals, the 2015 Future of Quality Report—the seventh of its kind—took a unique approach. ASQ turned to some heavy hitters from their respective fields to write 11 essays on the futures of their industries, and making predictions as to how that might impact quality.

What follows is a sampling from the report featuring experts Stanley McChrystal, retired U.S. Army four-star general; Jonathan Zittrain, co-founder and director of the Berkman Center for Internet & Society; Jim Davis, University of California-Los Angeles vice provost for IT and chief academic technology officer; Ronald Snee, a Six Sigma expert; Gregory Watson, a fellow and past president of ASQ; and Noriaki Kano, an ASQ honorary member, professor emeritus at the Tokyo University of Science and the Kano model namesake. Read the sidebar “2015 Future of Quality Report” for a summary of essays not featured in this article.

In 50 Words Or Less

- For its 2015 Future of Quality Report, ASQ asked experts to share their ideas about what challenges and opportunities lie ahead.
- Their insights included using data to solve previously unsolvable problems and better connect people and processes, thus gaining knowledge of customers' personalized needs and how quality influences sales.

zom

Networking people

In “The Future of Leadership,” authors McChrystal and Rodney Evans, chief innovation officer of the McChrystal Group, explain why adaptability will be key for any organization striving to keep up with increasing technological changes that can rapidly alter goals.

“What if the problem you spent today solving won’t be relevant tomorrow?” McChrystal and Evans wrote. “Organizations must be able to identify and solve emerging variables, and they must do it repeatedly.”

They believe organizations must overhaul their decision-making processes “so that those nearest the issue, with the greatest understanding, are empowered to act.” Giving staff more say in decisions is sometimes resisted because big-picture context isn’t understood at all levels of an organization.

Overcoming this requires transparent leadership and commitment of time to communicate and collaborate across departments. Organizations also must consider replacing their pyramid leadership structures with networked leadership.

Networked leaders act as gardeners: using an organization’s talent (preparing the seed bed), effectively entering information into the system (watering) and connecting staff members who may be siloed (cross-fertilization). Meeting short or long-term goals shouldn’t result in rewards for networked leaders. Instead, skills such as self-awareness and constant learning will be recognized because they don’t rely on deep

knowledge in just one area.

“Deep technical understanding in one’s field of expertise doesn’t prepare leaders for today’s role of leader as gardener rather than chess master,” McChrystal and Evans wrote. “Meaningful, impactful change requires investment in both organizational process and leadership skills in order to be adaptable over time.”

Networking things

Zittrain believes societies must consider how they’ll adapt to the “Internet of Things” (IoT). Primarily, they should focus on not limiting the potential for innovation in these products and not compromising information security.

To explain IoT, Zittrain imagines an internet-enabled shovel and offers the shovel’s possibilities as such:

- Sounding alerts that are personalized to the person using it (the handle knows the person’s heart rate is too high or calls for an ambulance if his or her hand is too cold).
- Aggregating data across a city to help direct where plows are needed, or that can show where the deepest snow is located based on areas where people are shoveling the most—or possibly the least if there’s too much snow to attempt shoveling.

While these innovative features sound exciting and exploring more possibilities is a fun exercise, Zittrain believes future organizations must determine who will be allowed to create these features.

Examples of smart manufacturing in commercial activities / TABLE 1

Leverage data to integrate operations	Optimize efficiencies across an entire chain	Cooperate to improve individual manufacturing processes	High degrees of product customization
<ul style="list-style-type: none"> • Real-time visibility to suppliers so demand volumes and timing are served with minimal inventory in the supply chain and consuming locations. • Electronic chain of custody from suppliers—including quality variations—so production processes can be adjusted prior to receipt of components or materials. 	<ul style="list-style-type: none"> • Data and information from across a supply chain to build intelligence in end-to-end business processes, and unlock new solutions to drive optimization. • Synchronized supply chains with real-time demand forecasts to reduce problems such as order changes, expediting, premium freight and just-in-case inventory. 	<ul style="list-style-type: none"> • Batches reduced to one-piece flows by communicating consumption transactions, quality variations and response priorities to suppliers instantaneously. • Corrective action workflows triggered from process variations to integrate functional personnel in real time, regardless of global location. 	<ul style="list-style-type: none"> • Increased product complexity managed by digitizing production processes and using this intelligence to give customers more freedom to customize products and give manufacturers more ability to deliver them. • Control over production processes, changeovers and varying order sizes to match output with demand and be more responsive to customer needs. • Sequenced production to synchronous assembly of automotive instrument panels, door panels and consoles with the flow of components across a supply chain.

“Will things be able to talk to one another across vendors, or only to their makers?” Zittrain asked. “Who owns a thing—the purchaser? Or is it more like a service than a product?”

Zittrain explains that for PCs, anyone could write, share or sell software for them without manufacturer or operating system involvement. This also is the case for the internet.

“The internet has no main menu, no CEO and no business plan,” he wrote. “Anything could be built on top of it without permission of a central authority, and the resulting applications could, and did, surprise us in their reach and popularity.”

This openness has led to abuses in information security, which Zittrain previously believed could force the internet toward a lockdown approach that limits innovation and leaves us with information appliances—such as dedicated word processors or calculators.¹

Today, with the rise of smartphones and particularly the app store, he sees “a hybrid of the original PC, running outside code, and the information appliance, tolerating none.”

Endless numbers of apps permit great innovations, while manufacturers such as Apple can categorically or individually exclude programs they don’t prefer. With apps now available on tablets and PCs, Zittrain sees more potential for industry control and limitations on innovation:

The result is industry concentration in operating systems, and increased interest by regulators in monitoring and controlling what software is permitted to run—and in turn, what content can circulate.

To some, security should be paramount—so having the shovel able to talk to the tea kettle only invites trouble, with little upside. To others, quality is optimized when open-ended populations of coders can try a hand at improving the way things work.

Smart operations

By 2020, it’s estimated there will be 30 billion intelligent, connected devices.² Davis sees this as manufacturing’s opportunity to adopt new IT systems and technology to meet future industry expectations. In “The Future of Manufacturing,” Davis presents smart manufacturing (SM) as an application that can improve operations involving more complex products and markets (see Table 1).

“In business terms,” Davis wrote, “SM is the end-to-end use of real-time, networked, data-based intelligence

for enterprise integration of dynamic market demands, high-velocity technologies and value-added products in conjunction with increased economic, energy and material productivity, zero incidents, reduced industry energy usage and environmental sustainability.”

To better understand SM, consider seams and transactions that occur in manufacturing. A seam is a location in a manufacturing process or supply chain where two or more parts are joined in a transaction, and a transaction is how an organization bridges a seam.

In the food industry, for example, the process of getting food from a farm to a customer’s plate represents a long line of seams bridged by transactions, such as processes that ensure food products are free of contaminants, meet taste requirements and comply with regulations. These processes also can include suppliers that transport ingredients to manufacturers or growers, who are at the mercy of weather patterns.

“The food industry example changes dramatically if we apply SM to automate, redefine, and in some cases, eliminate seams and transactions,” Davis wrote. If a supplier were able to notify a manufacturer early on about variations in ingredients, the manufacturer could prepare process adjustments before the ingredients were received. Or a manufacturer could alert suppliers of production problems early enough for them to adjust product distribution before shipment.

These capabilities would require access to and development of new IT systems that could bridge all of an organization’s seams, but this remains a hard sell. A 2014 survey of manufacturers in various industries showed: “80% [of respondents] weren’t aware, didn’t see a need, or indicated that cost was a barrier or that management was resistant, even though the 13% who are already applying SM have experienced significant benefit.”³

Davis believes the movement to SM will start small, but ultimately it will bring about a new enterprise model: “A true industry-driven ecosystem can form and create a virtual enterprise model that incorporates physical assets as components to execute production of the right product, at the right time, in the right amount.”

Answering the big questions

Looking toward the future of the quality industry and where opportunities might reside, Snee and Roger Hoerl, a mathematics professor at Union College in Schenectady, NY, see five areas of focus for quality professionals:

1. Applying a holistic improvement approach.

2. Identifying and solving mission-critical (large, complex and unstructured) problems.
3. Leveraging big data to solve problems previously considered unsolvable.
4. Better addressing human variation.
5. Learning to use innovation for job creation.

In their essay, “The Future of Quality: Getting Better All the Time,” Snee and Hoerl explain how these needs are interconnected, can help organizations think broadly about continual improvement, lead to better results and more jobs, and improve the standard of living (see Figure 1).

Organizations must begin viewing themselves as business systems. Snee and Hoerl believe this allows for a holistic improvement approach, which includes every process across every department. This also means not limiting improvement efforts to a single location or culture.

“The holistic improvement approach views an organization or business as a system that can be improved at any location around the world, in any culture, in any business function,” they wrote. “Accordingly, a focus on holistic improvement moves improvement well beyond the factory floor.”

The authors believe many organizations’ total quality management (TQM) practices limit them by leading them to shy away from attacking mission-critical problems in favor of low-hanging fruit where success is easier and requires only minor projects. For the level of breakthrough success senior leaders expect, organizations must learn to solve problems that are too big for one lean Six Sigma project. Using a

statistical engineering approach can accomplish this.

“Statistical engineering’s five building blocks for such issues are problem identification, creation of structure, understanding the context of the problem, development of an overall strategy and creation of tactics,” Snee and Hoerl wrote.

Big data is another tool to help solve large, complex problems, but the authors warn that data are typically observational and likely not collected with attention to study design or measurement accuracy. In observational data, finding critical variables causing most of the variation requires problem-solving fundamentals found in statistical engineering, such as:

- Understanding that data studies require sequential analysis of multiple data sets over time.
- Knowing which strategy should be used to execute a project and conduct the data analysis.
- Determining the data pedigree (the data’s value, quality and how it will be analyzed).
- Having subject matter knowledge to define the problem, determine the data pedigree, and guide analysis and results interpretation.

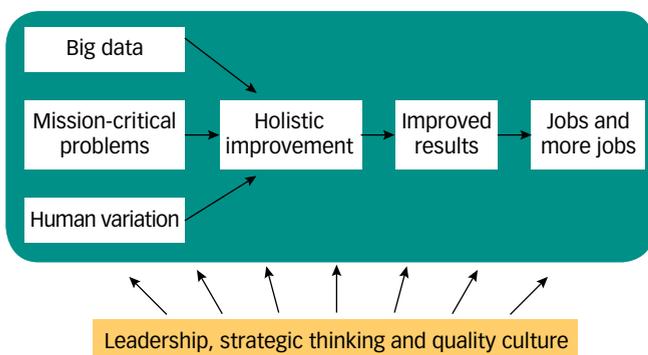
Despite tools such as big data, Six Sigma or TQM, humans arguably remain the largest source of variation. This variation can be amplified in the face of budgetary constraints, short timelines or fear of failure. Snee and Hoerl believe processes and products must be improved to better consider the potential of human variation. This could be IT and software adapted for those who lack computer literacy, medical instruments for home use or auto bumpers that cannot be damaged by low-speed collisions.

As organizations improve themselves, the authors see the trend of automation and use of low-cost labor abroad increasing, which could decrease the number of middle-class jobs—particularly in the United States and Western countries. Quality improvement, however, will play a role in helping organizations lower costs, improve efficiency, stay in business longer and thus create more jobs. “Economic opportunity is increased, and the standard of living, particularly for the middle class, is enhanced in the process,” Snee and Hoerl wrote.

Personalized customers

Authors Gregory Watson and his son, Andrew Watson, a media artist and educator, suggest that future product and service design requires deeper empathy for customers to create a more complete picture and in-

21st century needs and opportunities for improvement / FIGURE 1



clusive understanding of motivations behind customer requirements.

For consumers to gain confidence in a brand, its products or services must accumulate satisfactory experiences over time to build a foundation of expectation for future service that is fit for continuing attraction. “Such achievement is an outcome that must be ‘purposefully designed into’ the product or service proposition and not merely a serendipitous possibility left to chance,” the authors wrote.

Designers have traditionally fulfilled customers’ implicit and explicit needs in one of four ways:

- 1. The craftsman model:** A designer is directly connected with the customer, and the product is iteratively designed to align with the customer’s needs (for example, a swordsmith who designed a knight’s sword in medieval times).
- 2. The engineering model:** During product design and after the sale of a product, the designer has no observation of the customer experience and is driven by technical specifications alone.
- 3. The marketing model:** Marketing professionals gather customer input and supply it to the R&D team to incorporate into the product’s design.
- 4. The customer-driven model:** The customer is directly involved in the design, personalizing the product to fit his or her needs.

No matter how an organization decides to achieve customer satisfaction in its design processes, there are no guarantees, especially when considering 30% of human decisions are governed by rationality, and the rest rely on emotion.⁴ Delivering a product or service that attracts, therefore, requires designers to look beyond the user experience.

“It requires intensive, comprehensive learning about the broad spectrum customer experience and designing the customer experience into technical specifications,” the authors wrote. “Customers assess how the product or service actually suits their need in an experiential manner, as opposed to the rational-emotional judgment behind the purchase decision.”

More real-world understanding of customers and

their environments will be required of designers in the coming decades. Through more intimate knowledge of these perspectives, industries will see a rise in individualized technology design that can be mass-produced. Point-of-sale engagement in design will become more prevalent. This trend is already taking place today. In athletic shoes, for example, customers can choose their style, color, fabric or tread.

“Concepts from fine arts, studio work processes and rapid cycles of experimentation and innovation (for example, agile

design in software) could be used to learn more about the user’s experience,” the authors wrote. “Humanized technology at the point of use will be accomplished through a process of ‘mindfully designing,’ integrating customer empathy and artistic thinking.”

To stimulate this style of thinking, the authors see an opportunity for educational institutions to include curricula more integrated as a cross-disciplinary system. Adding art to the science, technology, engineering and mathematics movement would give future designers better insights into customer-centric attributes that go beyond the generic user experience.

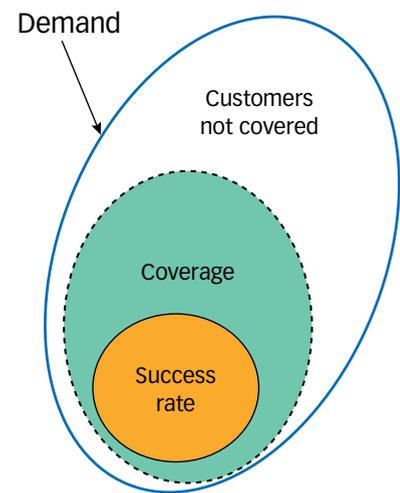
Quality of the sale

Kano revolutionized how organizations determine and define customer expectations when he developed his theory of attractive quality, later known as the Kano model, in 1984.⁵

Kano’s essay, “The Future of Quality: Toward Quality for Sales in Addition to Quality for Cost,” makes the case that competitive and global markets will require organizations to use a quality for sales (QfS) concept in addition to quality for cost (QfC).

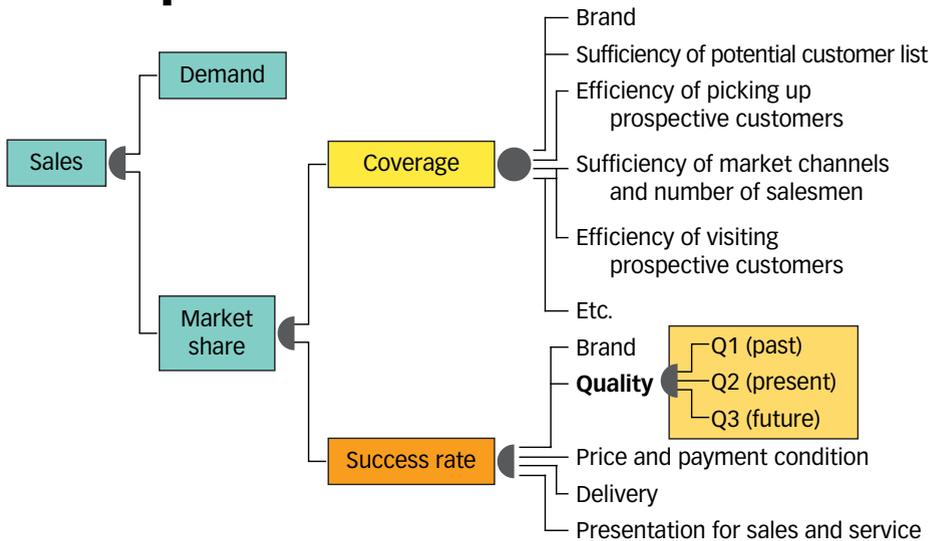
As illustrated in Figure 2, Kano defines sales as a function of demand (D), coverage (C) and success rate (SR). D is every customer who might want your prod-

Sales as a function of demand, coverage and success rate / FIGURE 2



Read the full “2015 Future of Quality Report” by visiting <http://tinyurl.com/2015futureofquality>.

Sales as an output resulting from inputs / FIGURE 3



issues such as reliability and safety. “For a car maker, the issue of greatest concern is when a customer who currently uses the brand’s car decides between replacing it with the brand’s new car or switching to a competitor’s model,” Kano wrote. These three Q’s are what he believes will influence customers in their brand selection.

Q1 can be subdivided into three types of questions the customer might consider when keeping or leaving their current brand of car:

- Q1a:** How was service during the warranty period? Were claims responded to quickly and completely resolved?
- Q1b:** Were there nonwarranty issues, such as uncomfortable

uct, C represents those who were reached by your organization’s marketing efforts, and SR is the number of customers who were marketed to and purchased

the product.

Figure 3 illustrates sales as an output that results from multiple inputs, including brand strength; marketing efficacy; and how a product compares to competitors’ products in price, payment conditions or delivery options.

Kano explains quality’s role in the process of a sale by using the example of a customer considering replacing his or her car of five years and dividing quality into three states: past (Q1), present (Q2) and future (Q3).

When considering Q1, customers are either happy or unhappy with their brand of car, depending on the number of issues they experienced. In Q2, customers consider the new model of their car either more or less attractive than a competing brand’s model. Q3 is how customers perceive future

seats, confusing dashboard layout or poor air conditioning?

- Q1c:** What are the customer’s overall likes or dislikes, such as customer service or the car’s style?

Addressing any of these quality considerations depends on whether an organization views them from a QfC or QfS perspective. Figure 4 illustrates the Q’s with their applicable frameworks.

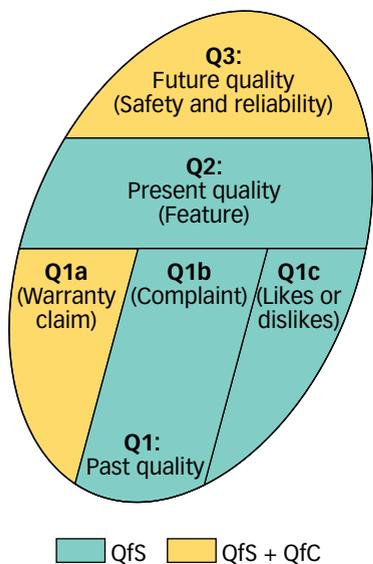
Q3 falls under QfS because it instills confidence in customers, but if there’s an issue that leads to a repair while under warranty, this will be in an organization’s QfC category.

For Q2, customers may seek more fashionable designs or new high-tech features, such as automated driving. This makes Q2 a QfS consideration.

In Q1’s categories, only Q1a falls under QfC and QfS. Because it covers warranty claims, which lead to additional costs, it’s an example of QfC, but it’s also QfS because of its influences on the customer’s replacement decision. Q1b and Q1c are QfS considerations because they do not cause the manufacturer additional costs.

Kano suggests quality activities be expanded to include the QfS concept, but concedes all activities can’t fall under quality professionals’ responsibilities. “However,” he wrote, “quite a wide area can be covered by them. In this case, we should start preparing for the new challenge.”

Sales influence from past, present and future states of quality / FIGURE 4



QfS = quality for sale
QfC = quality for cost

2015 FUTURE OF QUALITY REPORT

From aerospace and defense to K-12 schools, the 2015 Future of Quality report's essays covered a wide range of industries, offering insights such as: how to improve healthcare on a global scale, and what measures are being used to improve future energy efficiency and reliability.

Read the full 2015 Future of Quality Report by visiting <http://tinyurl.com/2015futureofquality>, which includes the following essays beyond what is covered in this article:

- "The Future of Global Aerospace and Defense (A&D): Implications of International Trends for Quality," by Stephen Rosen, a Beton Michael Kaneb professor of national security and military affairs at Harvard University in Cambridge, MA. Rosen reveals how the quality community may be affected by geopolitical and technological trends of the A&D industry over the next decade, such as increasing numbers of unmanned, autonomous systems; the global availability of high-tech knowledge creating the need to eliminate exploitable weaknesses embedded in systems; and how more system interconnectedness increases the potential for cascading effects if there's a failure.
- "The Future of Cities: Quality, Planning and Excellence in Public Sector Management," by Izabel Christina Cotta Matte—an architect, urban planner and civil servant of Porto Alegre City Hall in Brazil. Cotta Matte outlines a new culture of public administration in which a spirit of continuous improvement is crucial. She uses Porto Alegre as a case study in implementing a city-management model focused on executing public policy in a cross-functional manner, differentiating between city zones, promoting transparency and ensuring public servants are empowered in their respective fields.
- "The Future of Healthcare: Toward a Global Medical University," by Devi Shetty—a renowned cardiac surgeon, and chair and founder of Narayana Health in Bengaluru, India. Globally, only 15 to 20% of people can afford cancer treatments or heart, brain and joint-replacement surgeries. Shetty believes improving the cost and quality of care will require better global access to education to grow the pool of skilled healthcare professionals in underserved countries. To do this, he proposes the creation of a global medical university.
- "The Future of Education: Quality Teachers for the 21st Century," by JoAnn Sternke, superintendent of Pewaukee School District in Wisconsin—a 2013 recipient of the Malcolm Baldrige National Quality Award. As digital technology and big data become more common and advanced, Sternke sees education becoming more personalized and learner-driven.
- "The Future of Energy: Long-Term Trends and Global Implications," by Zheng Mingguang, president of Shanghai Nuclear Engineering Research and Design Institute. Mingguang foresees quality playing a vital role in the following trends in energy: renewable energy becoming dominant with fossil energy being complementary; a shift from mining resources to manufacturing them; energy coming from a more intelligent, synergistic mix of sources that are based on system efficiency and optimization; more concentration on knowledge-driven and technology-based renewable energy; and developing countries becoming the center of demand. —T.G.



What lies ahead

In the report's conclusion, ASQ chair Cecilia Kimberlin sees the future of quality professionals evolving to a state in which they cease being technical specialists and act more as collaborators and leaders.

"What is quality for the future?" Kimberlin asked. "Imagine a future where quality is an essential connector—a framework and network—for developing and advancing capabilities to create a better world and society."

For organizations to achieve this, she believes they must possess a philosophy that supports quality as an organizational mindset rather than a function or policy governed by a person or department. "Tomorrow's orga-

nizations need leaders who embrace quality as an enabler for success," Kimberlin wrote. "Leaders at every level, in every function, will lead more successfully if they embed quality into their thinking, analytics, strategies, planning and execution." **QP**

REFERENCES AND NOTE

1. Jonathan Zittrain, *The Future of the Internet—and How to Stop It*, Yale University Press, 2009.
2. Jim Davis, "The Future of Manufacturing: Bridging Seams and Transactions to Integrate Next-Generation Information Technology," *The Future of Quality: Quality Throughout*, ASQ, 2015, p. 22.
3. "Manufacturing Growth Continues Despite Uncertain Economy, According to ASQ Outlook Survey," ASQ press release, <http://tinyurl.com/growthinmanufacturing>.
4. Daniel Kahneman, *Thinking, Fast and Slow*, Farrar, Straus and Giroux, 2011.
5. The Kano model classifies customer needs into three attribute levels—one-dimensional, attractive and must-be attributes. For more information, visit <http://tinyurl.com/kanomodelexample>.